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WATERS OF WESTERN INDIA.

Part V.—Sind.

(By a Member of the Society.)

The first and most important point as regards the higher vertebrates is that Sind is only a sub-tropical country, and the aquatic birds, in particular, belong largely to the Palæarctic fauna.

Secondly, we have not here a great river receiving affluents, but one which discharges distributaries, so that spawning fish pushing up stream do not here leave the Indus, but come to it.

Thirdly, we have to deal with a rainfall so small and uncertain that it is a negligeable quantity. Some researches in which the present writer was concerned went far to support a theory conceived by the chief of Indian meteorologists, *viz.*, that Upper Sind receives no rain from the sea, but only gets its own evaporation partly returned in occasional showers. It is certain that the rainfall has greatly diminished since powerful and settled governments took the bridling of the Indus in hand, and prevented it from forming annually a shallow sea, with vast evaporation. My own opinion is that the ancient river will one day re-assert its sway, and that one of the most fearful catastrophes ever felt by any country will leave what we

now call Upper Sind a desert, and make Sibi, or some place thereabouts, the freshwater port of Central Asia.

But up to the present the biped has the best of it, though the tension and vicissitudes of the struggle can only be appreciated by those who have been in it. On this head I need only sum up by saying that the Indus, in Upper Sind, flows down a channel in the centre of a ridge, which ridge itself runs down the left, or eastern side of a wide shallow trough, and is continually trying, like all waters flowing at an angle to the Equator in the northern hemisphere, to shift its channel to the right or western side. On the eastern side the pressure is less; and the area below river level, population and cultivation are far inferior. But even here much land is lower than the flood level, and accordingly we have in Upper Sind two unequal populations dependent for their daily bread on getting a certain amount of Indus water, and for bare existence as terrestrial beings on keeping out the surplus.

There are analogous cases in Holland, still more in Egypt and Lombardy; but these are small areas in comparison, and moreover are much more thickly-populated, so that they have stronger means of resistance to the powers of the waters. If the tremendous energy of the "pax Britannica" is allowed to hold head against the Indus for a few more centuries, it may accumulate a population as numerous, and as well able to fight the river as those who dwell by the Nile or the Po.

In the meanwhile a single campaign interrupting the engineers might at any time bring about the cataclysm. It is perhaps permissible to conclude this sketch by observing that although the Sindi cultivator is very far below the Dutch peasant in every respect, he has no cause to envy the wretched labourers of Northern Italy, and still less so as regards the fellaheen of Egypt *servi servorum*.

Of all agricultural classes in this presidency, the Sindi cultivators are the best fed and most independent. They get meat, most of them, once or more a week, plenty of good fish, which concerns our subject, and dairy produce. If they don't like one landlord, as land is more abundant than hands, they can choose another at their pleasure; their stature and bearing show all this, in Upper Sind at least. The human animal, at any rate, can thrive in the plain of the Indus, and if its climate is to strangers simply infernal, the natives are used to it, and know no better. In dealing with any other country these details would be irrelevant; but in Sind all animals, and

especially man, live upon the Indus, and are justly termed aquatics from the Commissioner and the General down to the last Bhang and Mohana.

The Indus, as abovementioned, has in Sind no affluents but distributaries. Near the coast these become mouths, things common enough with great rivers. But higher up they are canals under human control, or "lets," that is natural and uncontrolled overflows. Those hollows, in which, after the subsidence of the snow-fed inundation, water still remains, are called "Dhands" (arms) and "Kolabs" (deep waters), and all of these swarm with life.

The highest aquatic mammal after *Homo sapiens*, is the Otter (*Lutra nair*). It is rather a puzzle with the otters that the same species seems to vary greatly in size with locality. The otter of Sind is nearly as big again as that of our peninsular provinces, but no larger than in Bengal or Malabar. But the same occurs in Europe. I once had an admittedly large specimen weighed on a particular river in Ireland, and it turned the scale at 16lbs. avoirdupois. But weights exceeding 20lbs are common in the British Isles, and you may see 25lbs. and 28lbs. recorded in the *Field* often enough. The lesson is that the genus Lutra and its species are subject to great local variation in this respect.

The next aquatic mammal is a very strange one, the Indus Porpoise, or "Bullan" (*Platanista gangetica*). I prefer to treat this remarkable animal as identical with the Gangetic species, because all I have to say will apply to either, and the specific distinction is very doubtful, consisting chiefly in the superior size of the few specimens obtained from the Indus. It is very difficult of capture, as are all the freshwater cetacea, and I myself exhausted money and influence in vain in the effort to obtain a specimen. A native chief is said to have been more fortunate, and to have applied his captive to a most extraordinary use.

The "Bullan" resembles the ordinary mammalian dolphins proper (not the *fish* wrongly so called) in general outline, having a fusiform body and long pointed snout, with teeth in both jaws. It differs from them in having little or no back fin, and from the common porpoise of Europe, and the Steno and Neomeris of our seas in having (as already mentioned) a long rostrum or beak-like snout. The same difference (with minor ones) distinguishes it from the nearest other freshwater cetacea; (*Orcella fluviatilis* of the Irrawady) and on the whole its nearest living relatives are supposed to be the *Hy-*

peroodon, a large whale of the North Atlantic, and *Inia*, a porpoise or dolphin of similar habits which is found in the great rivers of South America.

When we know more of those of China, it seems not unlikely that we may find something of the sort there.

It is by no means evenly distributed; indeed, nothing is on the Indus. Where there are towns, their rubbish and sewage probably attract fish; at any rate these and the "Bullans" are most common in such places. The water-fowl, on the other hand, are most common on undisturbed reaches, and the crocodilia are very locally distributed, whereof more anon. Some parts of the great river seem absolutely desert in every way.

Amongst aquatic birds the great Sarus Crane, essentially a tropical form, is rare. The White Siberian Crane (*Grus leucogeranus*) is recorded, in my opinion, very doubtfully, as a rare straggler from the north. The Grey Crane (*Grus cinerea*) is common enough in winter, but the Demoiselle Crane rare. We have here all the southern plovers, and the Chettusiæ are abundant, and the European Lapwing occurs pretty frequently. *Esacus recurvirostris* is said to be known as the "Chota Talúr" or "small sort of Houbara" (*Otis macqueeni*), but this is probably the result of a confusion between it and *Œdicnemus crepitans*, the Lesser Stone Plover or Bastard Florican, which certainly does bear that name, and deserves it by its habits, which the former bird does not. Two swallow plovers, *Glareola orientalis* and *torquata*, breed here, and *G. lactea* occurs in considerable numbers, and may breed. *Squatarola helvetica*, the Grey Plover proper, is abundant in places in the cold weather, chiefly on the sea shore, and so on throughout their tribe. We have all the black-and-white marine plovers, and probably most of them breed.

Of the Raptores (which might fairly have claimed precedence), we have the White-tailed Sea-eagle, or Erne (*Haliœtus albicilla*), the Grey-backed Sea Eagle, as on the Konkan coast (this latter breeds near Sakkar), and the Ring-tailed Sea Eagle, also breeding. This last bird has one old-established eyrie in a sacred pipal tree near Bori Bunder Railway station, where the birds do not seem to care twopence for the continual throng of men and noise and steam of the engines. The Osprey is common, and said to breed. *Spilornis cheela* is reported, but I have not seen it, and the Peregrine Falcon hunts ducks so constantly that it may almost be called a bird of the

waters. In Sind, at any rate, its haunt is always near water. *Circáétus gallicus* is reported; I have not seen it.

The Harriers abound, especially the Marsh Harrier. This, a large Buzzard, and the Dwarf Eagle frequent marshy ground and the edge of water. Mr. Hume has recorded his *Milvus major* and the Grey Kite (*Elanus cæruleus*), occurs on the Indus; the Brahminy Kite is pretty common, and breeds, and so does the Fish Owl (*Ketupa ceylonensis*). The aquatic raptores, it will be observed, retain a strong tropical element, though, on the whole, the Palæarctic forms slightly predominate, and are by far the most noticeable.

Of Kingfishers we have one northern species, the European Kingfisher, *Alcedo ispida*, said to breed; and one tropical, *Alcedo bengalensis*, which it is said does not. *Halcyon smyrnensis* and *Ceryle rudis*, both of which breed in Sind, are sub-tropical forms extending from the Mediterranean to the Equator. I knew a kingfisher to breed in a suspended grass-woven nest, probably originally the work of a Ploceus or allied bird, in the bank of a canal near Shikarpur. I supposed the bird to be *A. bengalensis*, but it was probably *A. ispida*. We have here none of the Malayan forms like Ceyx, or even Pelargopsis.

Amongst Storks, Sind possesses the great Adjutant, the Jabiru (*Mycteria australis*), the true Black Stork, more frequent here than in our former provinces, but only a winter visitor; the Black White-necked Stork, a resident, and the European Stork, abundant in the cold weather only. The Grey and Grass (Purple) Herons abound, with several species of White Egrets and Dwarf Herons, Night Herons, and Paddy-birds innumerable. Nearly all breed here. The European bittern is not very rare in the cold weather; and of dwarf bitterns, *Ardetta flavicollis*, *cinnamomea*, *sinensis* and *minuta* occur, and probably all breed. The first and last certainly do.

The Spoon-bill is common in the cold weather. I do not think it breeds here; but the Pelican Ibis, Shell Ibis, White, Black, and Glossy Ibises all do, especially in the marshes and islands of what is called the Eastern Narra, now the uppermost branch of the Indus on its left bank, draining off towards the Great Desert, east of the Ghar Hills.

In Sind, the Snipes and their allies are all of northern types, with one exception, the Painted Snipe, which breeds here. The Woodcock is not recorded from Sind. Of the Parrinæ we have the Water-Pheasant (*Hydrophasianus chirurgus*), which is resident, but

not the more tropical Bronze-winged Jacana. Amongst *Gallinulinæ* the Purple and Bald Coots are abundant, the latter especially occurring locally in flocks of many hundred birds. The Watercock (*Gallicrex*), unknown in our Peninsular provinces, is found here. I do not know whether it breeds, but this is likely. The Waterhen and Crakes are numerous, but not peculiar, except *Porzana minuta*, an outlier from the Upper Asian region.

Passing on to the swimming birds proper, the sub-tropical character of the Avifauna becomes still more marked. Swans, probably *Cygnus olor*, have been seen and shot. The Flamingo is common, going somewhere north to breed in June, and returning in September. The Grey Lag Goose is locally abundant in winter, and the Barred-headed Goose, *Anser indicus*, not much less so; and *Anser albifrons*, a decidedly Palæarctic bird, occurs. The tropical Black-backed Goose is only found as a straggler. The Small Whistling Teal, however, abounds and breeds, and is commonly known by the quaint name of "Inundation Duck," as if it were a distinction amongst ducks to thrive upon inundations. I doubt whether the larger and less common Great Whistling Teal, *Dendrocygna fulva*, breeds here. The Brahminy Duck or Ruddy Sheldrake is common enough, but not resident; the true Sheldrake, a sub-arctic bird, is an uncommon cold-weather visitor. It has, I think, no breeding places in any climate warmer than that of England.

The first and most important true duck is the typical and essentially northern Mallard, which abounds in the cold weather. With it come the Shoveller, Gadwall, Pintail, and Widgeon, the Red-headed, Red-crested, White-eyed, and Tufted Pochards, all in great numbers. The sub-tropical Marbled Teal, rare in Gujarat and unknown almost in the rest of this Presidency, is a common cold weather visitor here. Its nearest relatives are not the teals, but the gadwalls.

The Spot-billed Duck is a resident, the Golden Eye and Scaup are rare cold weather visitors, so are the Red-breasted Merganser, the Goosander, and the Smew. The Tropic birds and a Gannet (our old friend *Sula cyanops*) occur on the coast, but cannot be said to frequent it.

The White Pelicans, more or less, are cold weather visitors, and the Grey Pelican is a resident, all occurring in considerable numbers (allowing for the great size and voracity of these birds).

They are tamed, or rather confined, by the fishermen of the Indus, who eat them and make oil of their fat.

The European, Chinese, and Little Cormorants abound, and all three are said to breed in Sind. As regards the first-named, this seems to require further examination.

The Snake Bird undoubtedly abounds and breeds here.

Of true Teals, the Grey and Garganey ("blue-winged") Teal are common in winter, and the Siberian *Querquedula formosa* (or *glocitans*) has been obtained.

The essentially tropical Cotton Teal (which is not a teal at all, but a dwarf goose) does not, I think, occur in Sind. I have one report of the Bengali Pink-headed Duck occurring as a straggler, but it cannot yet be called a recorded species.

The universal Dabchick is common, and the Crested and Black-necked Gulls occur, the latter especially near the mouths of the Indus.

Of Seafowl proper we have one, Petrel, *Oceanites oceanica*, and a shear water, *Puffinus persicus*. The gulls and terns are abundant, much more so than in the Konkan region, and, as might be expected, show a strong northern element. The strange Skimmer (*Rhynchops*) is locally abundant on the Indus.

Reptiles.

Amongst the Chelonia, or tortoises and turtles, Sind offers nothing new worth noticing in such a paper as this, except that (as might be expected) the aquatic species are more developed in the Indus than they commonly are in the lesser fresh waters hitherto noticed. In suitable places, and especially near such large towns as Sakkar, where food is abundant, they reach dimensions at which an alderman need not sneeze. Of tortoises there are two species of *Pangshura*, with 5 claws on the fore feet and 4 behind, *P tentoria* and *smithii*. Neither reaches a foot long, as hitherto observed. Of *Batagur* there are three species—*Dhongoka, Baska, Thargi*—all with the same unguiculation, but approaching or reaching 2 feet in length, a great size for an aquatic tortoise.

Of turtles we have the small *Emydla granosa*, seldom attaining to a foot in length, *Trionyx gangeticus* and *Chitra indica*, of which the last-named attains three feet long, and the former two, and probably both measurements are often much exceeded. The marine turtles of Sind are *Chelonia virgata*, the Indian Green Turtle, and *Cawana olivacea*, and enough has been said of them before.

In the next group, however, we come on an important novelty. *Crocodilus porosus* does not seem to have been identified here. *C.*

palustris is locally abundant, and I need waste no words on the oft-told tale of its ugly sanctuary and disgusting rites near Karachi. But we find here a new reptile quite out of place in this half-western land.

This is the Gavial, or Gharyal, or fishing crocodile (*Gavialis gangeticus*), characterized by its dentition and long snout, resembling to some extent those of the garfishes, and particularly suited to the capture of fish, and certain modifications of the nostrils, enabling it to remain for a very long time under water. It is, moreover, much less active on the shore than the broad-snouted crocodiles proper, and is seldom accused of the murder of terrestrial mammals in the shallows, or on the beach. This curious creature has its head-quarters in the great rivers which debouch into the head of the Bay of Bengal; and one allied genus (*Tomistoma* or *Rhynchosuchus*) extends at least as far east as Borneo. It has no representative in the New World, whose alligators indeed show a form rather less purely aquatic than that of our crocodiles proper, the limbs being less fin-like. Only one Old World alligator has been reported, a rare Chinese species. Three species of Monitors (*Varanus* and *Psammosaurus*) are found, often in considerable numbers, especially the common "Ghorpur" (*Sindice, Goh*), which used to trouble me much in Shikarpur by invading a poultry-yard carefully fenced against all other intruders. Smooth mud walls, hard as stone, defied rats and snakes, while cats and raptorial birds were excluded by a strong net covering the whole enclosure. But the "Gohs" climbed the wall, worked through the net, and played Old Harry with eggs and young birds. One comfort was that they were not able do much in the gymnastic way when gorged; and usually paid for the night's meal by the penalty of "infang thief" in the morning. I have not myself had occasion to note anything particular about the freshwater snakes of Sind, and the *Amphibia* (which in common parlance we class with reptiles) present no peculiarity worth noticing here. Mr. Murray notices no special genera of either, and only a few new species, a sea-snake, a toad and a frog.

The Fishes, too, belong mostly to genera and species already noticed, but there are some points about their distribution and habits worthy of attention.

The typical Mahseer, *Barbus tor*, which perhaps does not occur in any other west-flowing waters of this Presidency, is certainly an inhabitant of the Indus, although, within our boundary, that

river does not afford the alternation of rocky rapids and deep reaches; wherein the Barrajute and its other favourite streams abound.

The small but sporting "Mahseer," which is found in the hill streams of the western border, is probably not specifically identical. Indeed, I have reason to suspect that there are several species, but I have not fished those waters myself, nor have I any specimens to go on. I do not think that any *Oreinus* (mountain barbel) has yet been identified in Sind. But a careful and keen-eyed observer, who unfortunately was not an ichthyologist, reported "an unmistakable trout" to me, as occurring in a stream on the east slope of the Kirthar Range, above the Mehar and Larkhana country. It seems probable that these may have been *Orcini* of the type known further north as "Himalayan trout."

Without specimens before him, no testimony yet available will justify a naturalist in accepting an Indian species of *Salmo*.

Amongst the *Labeos* we find again an old acquaintance, *Labeo rohita*, which we parted with in the great east-flowing rivers of the Deccan plateau.

Here it is abundant, under the name of "Dumbro," and ranks in the fish-trade of Sind second only to the "Palla," whereof more anon. In towns remote from the Indus it is the principal fresh fish. The "Palla," like all Clupeidæ, dies shortly after capture, and rots soon after death; and here it is confined to the main stream.

The "Dumbro," on the other hand, bears confinement in water well; and, even when dead, stands some time and transport.

One of the chief "Dumbro" fisheries is at the head works of the Eastern Narra Canal, were what is called a "regulating bridge" (*i.e.* a bridge whose arches are sluices of a rough sort) forms a fall. I have already pointed out that the Indus, in Sind, has *distributaries* instead of *tributaries* (with the unimportant exception of what little water from the western Border hills may occasionally find its way in by the Aral).

A consequence of this is that when the annual inundation sets all large breeding fish on the run, their course up stream is towards the main river, not *from* it, as in waters turned right-side up, and so the "Dumbros" run up the Narra from their winter quarters in many a marsh and "kolab."

At these headworks they find the fall, and what is worse, a lot of nets hung before it in rectangular timber frames, and as they leap at the obstacle they fall back into the nets.

The fishermen, on taking them out, thread them *by the eyes*, with a huge iron needle, on a line whereof the end is made fast to a stake in the water; and, having so bestowed the morning's take, belay the needle-end of the line to another stake, and wait for their customers, who know well when and where to come. I have often seen 5 or 6 dozen of Dumbro, averaging well over a stone weight, many over 20 lbs., on such a line, and the first impulse of any civilized man is to put a violent end to such a cruelty.

The reasons why this cannot be done are matters of administration, and not of zoology.

To the end of my own time on those waters, I never could endure the sight of that line of blinded fish, but I am bound to admit that their gestures were not expressive of agony, and from what we know of the nervous system of fishes, it is probable that their sufferings are much less than a highly-organized mammal can conceive.

Indeed, even the inferior mammals, and especially the ruminants, seem to be gifted with a marvellous insensibility to torture, which any one who has seen in India the sacred bovine race under the hands of its worshippers, may well thank God for, if the poor brutes can't do it for themselves. This, however, is a digression.

I am informed, not very credibly, that the "Dumbros" can be caught in the Narra, below this bridge, "with flies, just like salmon." If this is true, the sport is probably the best rod-fishing in this Presidency.

Amongst catfishes the Pádi (*Wallago attu*) is much the finest and most palatable in the Indus, but the English name is usually given there to a much commoner species of *Rita*, called in Sind, "khaggo."

This fish is easily caught with hook and line, but little esteemed, because, though the flesh is good enough, there is very little of it after deducting a huge bony head and a lot of spines and fins. It expresses its disgust by an odd grunting noise, something like that of the European gurnet. This spelling, "*gurnet*" is now treated by English writers as inaccurate, and the right thing is supposed to be "gurnard" from the French "groguard," ("grunter" or "grumbler"). But all editions of Shakspeare (I Henry IV., Act iv., scene 2,) have "soused gurnet," which was, apparently, in no better reputation in Falstaff's day than soused "khaggo" in Sind, and probably for the same reason, namely, that there is so little meat on the fish. The flavour, in each case, is as good as that of

many fish more highly reputed; but an old fisherman's joke is that "the flesh on a gurnet's head is all poison" (there being *none*), and our catfish is in the same case.

The murrells abound in some of the *kolabs*, and reach a great size. I had once an odd experience in shooting at one across a channel. The heavy bullet, driven by four drachms of powder, not only cut the fish's head off, but knocked the body clean out of the water on to the bank. He wasn't a *very* large fish, but there was enough of him for breakfast and dinner.

I never got an eel in Sind, but I heard of them, and no doubt they are there, only, as elsewhere in India, the local tackle is made up for other fish, and the eels escape it. If you want to catch eels in large quantities, you must fish for them with their own gear; except in the case of bottom fishing in some European waters, where they are apt to come unwished for, they might fairly say not quite uninvited.

But all these and many others are mere accidents and superfluities in Sind. When a man there talks of fish he means "Palla," as sure as a man using the same word on Tweed or Shannon means salmon.

The capture and distribution of this fish are the chief livelihood of some thousands of persons. To the remaining population of the province it is an important article of food, and, in short, the whole business is one of the great freshwater fisheries of the world. Here alone does the Government of Bombay make a serious revenue from fisheries, and that on this fish alone, or almost alone, claiming one-third of the produce or its equivalent. The great riparian jaghirdars do the same, and the claim is never disputed. Having premised so much, it is time to say something about the Palla himself, and the first thing to say is that the term "Salmon of the Indus" is a "chee-chee" abomination, not to be used amongst Christian men. I have said before of the mahseer that he was about as like a salmon as a buccaneer is like an officer of the Royal Navy. All four are pugnacious aquatic creatures, and that's all.

But when it comes to the poor Palla, the comparative mammal must not be a buccaneer, but the most timid coaster of the most timid nation, a Loochoo Islander perhaps, or an Otaheitan.

The Mahseer does, indeed, resemble a salmon in taking a fly, although, as he would rather take anything else, the resemblance stops there. But the poor Palla never thinks of hurting a fly or

anything else; he resembles the salmon in being anadromous and good to eat, and that's all. He is in fact the Indian Shad.

The English Shad or Allice is not a very common fish, and I believe is only important in the Severn. It is, however, worth while to notice the similarity of "Allice" and "Hilsa" or "ilisha," the Bengal name of the Palla. "*Alausa*" is a Latin name, but whether taken from the West or the East does not appear. At any rate, the Shads are now properly classed as gigantic Sprats (*Clupea*), and our fish is *Clupea ilisha*, and is the most important of the breed in freshwater, except, perhaps, the Shad of the United States, which is also the subject of a great fishery.

The difference between Shads and other Sprats is—firstly, that they run up rivers to breed (are anadromous), and secondly, that they are the giants of the genus *Clupea*. I have not my Sind notes at hand, but can safely say that the Palla usually exceeds 3lbs., and very rarely 6lbs. in weight when in decent condition (fresh-run). But some have been weighed in my presence over 7lbs. just out of the water.

In that condition the flavour of the Palla is very much that of a fresh herring, but like all the tribe he decays rapidly. A really fresh Palla is one fish on the table, and one two hours caught in another. After six hours he is very often quite inadmissible *au naturel*. The Sindis, however, are great hands at salting, drying, and kippering him, and I remember with affection several ladies whom the customs of the country never permitted me to thank in person, but to whom I yet stand indebted for breakfasts that Donegal or Perthshire could not have beaten.

Finally I have, with regret, to say of the Palla that he is most sinfully bony, so that the anatomising of him in a manner to make him eatable is one of the fine arts of Sind, and that his roe, though well flavoured, is so dry as to require cent. per cent. of butter before you can swallow it.

So much for the Palla himself, but I should not have described the waters of Sind if I had not more to say about his capture, which depends upon methods showing an odd mixture of barbarous mechanical ignorance with a profound knowledge of one of the least commonly known secrets of nature.

In the snow-fed Indus, the upper water, warmed by the sun, always retains its place, and, as elsewhere, flows at a much higher rate of speed than the colder and silt-laden bottom-water. To the Palla

pushing up stream, this is obviously a good reason for swimming low; just as we, in the like case, choose the dead water under the bank.

The Sindi provides himself in the first instance with an Y-shaped pole over 20 feet long, and supplies the fork with netting, till he has something like an huge hideous landing net. Having next secured an "embarcation" (whereof I shall discuss the varieties hereafter), he launches himself on the Indus, and drifts down stream holding his net vertically. As he floats with the rapid surface-current, the resistance of the slow bottom-water makes his net bag up-stream, just as a steamer outstripping a light breeze leaves her smoky pennant behind her. Into the open mouth of this the Palla, pushing up with the crazy impulse of all spawning fish, runs headlong, and warns the fisherman of his presence by a chuck, as he strikes the pocket of the net. It is probable that he would hardly have sense enough to back out, but all trouble of considering the matter is spared him. On feeling the "chuck," the fisherman, with a sharp upward turn of his arms, causes the long purse of the net to turn once on itself, effectively twisting in the prisoner, and then shortens the shaft and net, hand over hand, till he can get his finger and thumb into the latter's gills, through which, if he has no boat, he straightway runs a needle and thread of the sort already described in treating of the "Dumbro." Some scrupulous Mussulmans are said to cut the Palla's throat with a knife, according to the formulas of the law. But I never saw this done myself; it is clearly unnecessary from a common-sense point of view in most cases; and the Sindi fishermen notoriously consider the gills as the result of a throat-cutting performed by the Prophet himself, to sanction to their usage even fish otherwise unclean (the large scale-less Sibiridœa). Under certain circumstances, presently to be noticed, there is another reason for the use of the knife.

The Palla fisher, when he has got to the bottom of his "cast" or drift, must get up to the top of it again, as best he can, and *de capo* to the end of his working day. His most famous and extraordinary craft is an earthen pot, and since the wise men of Gotham went to sea in a bowl, nothing quainter has been seen. The Palla-pot is a huge, lenticular-shaped, neckless and bottomless jar. By the last phrase I mean that, like many Indian pots, it has no bottom capable of holding it upright. This being launched, the fisherman balances himself on one shoulder of it, and floats down

as described. While he has only to hold the net upright, this is all fair sailing, but when it comes to getting in a fish, no Caucasian has ever made out how he maintains his balance, which is so ticklish that the knife must then really be brought in to quiet the fish before *it* is consigned to the hold of this queer ship. If he overlies the hole, a strange disaster befalls him. For even the top water of the Indus is cooler than the air in a pot that has been lying on its broiling shores, and the rapid contraction of the contained air on cooling will hermetically seal, for a time, the pot to the stomach of any one who allows himself to loll over its mouth. It is said that this disaster overtook the only European who ever dared to be skipper of a "Palla-pot," a mythical Major, whose vagaries are fast becoming good food for the folk-lorists and Solar legend hunters.

Where the drift is long, the ponderous pot would obviously be inconvenient on the return-trip, and in such places it is usually replaced by gourd floats, the needle and thread arrangement serving to secure the fish. But both of these vessels are most appropriate to the neighbourhood of markets for fresh fish.

Now there are long reaches of the Indus almost desolate (but for the Palla-fishers), and on these the fishery is conducted with a view to salting or drying the take. Here we have another ship, the "Palla-Dhundi" or "Shad-punt." The simple architecture of its hull is not very unlike that of a Thames punt. Over this, a few tamarisk poles and mats form a sort of spar-deck, under which the ship's company live by day, and over it they sleep at night, as in their atrocious climate every man seeks the slightest available elevation to sleep on, in the hope of getting whatever breeze may be stirring.

A "Palla-Dhundi" is a queer little Noah's ark. There will be in it one or two Mohánas (the fisher caste of Sind), their wives and children, a couple of goats, landed here and there to browse on the often desolate shore, a dog or two, and possibly a cat. It has probably a dozen outriggers, each of which, under favourable circumstances, sustains a half tame pelican or heron. The pelicans are eaten and their oil sold (as a native medicine). The herons are sold as subjects for falconry, which is a very living sport in Sind. It is said that both otters and cormorants are kept to help in the fishery, but I cannot now remember having seen either so used, though both are often caught by the Mohánas, who are great fowlers and hunters, as well as fishermen.

The women help to work the boat with an efficiency worthy of Black-eyed Susan, but it is said that they ought not, by rule, to catch fish, nor the men to trespass on their province of selling it. They are stalwart viragos, and stout asserters of women's rights, to an extent which shocks all good Mussalmans of Sind. The "Dhundis" generally work in great fleets, and assemble at riverside camps, which become fishing-ports for the time being, where their owners settle accounts with the contractors who have bought the fishery of each district from Government, or the great riparian landholders. The due of these is usually one-third of the take, and they generally purchase most of the rest, with much squabbling, stoppages of pay, frequent strikes, and an enormous amount of cheating in a sort of "Tommy shop" barter. However, *all* are pretty well matched, and cannot dispense with each other.

In any country but India, capital, law, and education (such as it is, *viz.*, knowing how to cast an account) would be too much for the operative. But the Mohána caste is a vast localized trade's union, and the contractor who could not come to some settlement with the fishermen of his own district would not be able to import others. The Mohána himself is troubled with no scruples, or rather his wife, who does the bargaining, is not, and so everything finds its level comfortably enough in the end.

In this sketch of the waters of Sind, I have omitted one of the most remarkable, the Manchar Lake, because enough has been said about it in this Journal by Captain Becher. I have, moreover, been somewhat more sketchy than usual in dealing with the superior vertebrates, but these have a local authority of their own, Mr. Murray, whose work is probably in the hands of all those working on the spot, and people at a distance want only the more striking outlines of such a matter. He has not, I think, yet published the part of that work relating to fishes, but it is not my business, in such rough notes as these, to forestall him; and the molluscs have been noticed in a paper in his own Magazine.

I might indeed have dwelt upon the rare Horse Marine and River Pirate, who occur (*me teste*) on the Indus, in the Khairpur State. But these animals, with the extinct Centaur and Sphynx, and the barely surviving Hesperian Gormagon, belong rather to the domain of the Anthropological Society.

There is, however, one very remarkable thing to be noticed in the zoology of the Indus, which may fitly be dealt with here.

My readers will have noticed that it contains one cetacean, one crocodilian, and one fish, which do not occur elsewhere in waters flowing into the Arabian Sea, but abound in those that meet the Bay of Bengal. These are *Platanista gangeticus*, *Gavialis gangeticus* and *Labeo rohita*.

The cetacean, like all other cetaceans, cannot land at all. The reptile is the most aquatic of all the crocodilia, and its movement ashore is confined to crawling on to a sand bank for a nap. The fish (a thing necessary to specify in India, where we have several fishes quite at home out of water), is a high Cyprinoid, and incapable of terrestrial movement. How did they get there?

The answer is in one of the strangest chapters of recent geology, known to Indian professors of that art as the "Legend of the Lost River."

Many of my readers know that the great and ancient rock formations of the Peninsular proper are separated from the loftier but more modern Himalayas, and Afghan and Belooch hills, by a great elbow-shaped plain, the west part of which forms the valley of the Indus and great Indian Desert; while the Eastern is the region of the Ganges and its tributaries. The former is mostly sand, and the latter mostly loam, but they melt into each other between the Jamna and the Satlej at an almost imperceptible watershed, nearly due south of the famous Siwalik Hills, and pretty well identified with the legendary land of Kurukshetra, the cockpit of all decisive Indian wars, from the time of the Mahabharat until a new element of battle arose out of the sea.

Here, all Indian legends say, flowed a sacred stream, the Saraswati, which joined the Jamna, and is still supposed, by a pious fiction, to do so at Prayaga or Allahabad. In that region the Saraswati is not now recognizable to the modern geographer. But about the doubtful watershed there are certain ancient channels that fill in time of great rain. And by the help of these, and of our modern knowledge of the laws that govern rivers, we can piece out the story of the Lost River.

It probably did originally join the Jamna, and drain into the Bay of Bengal. But being a river of the Northern Hemisphere, flowing at an angle to the Equator, it was bound (by laws which need not here be discussed in detail) to bear upon its right, or western bank, and probably did so until, in some year of mighty floods, it cut through the contemptible watershed, and turned its

waters westwards into the great drainage system of the Indus, *carrying with it its Bengali fauna.* The upper springs of the Saraswati, following the same law, have long since become those of what we now call the *Satlej*, and of the drainage channels of the plains of Kurukshetra, the greatest still turns westwards, and its overflow is absorbed in the Great Desert, or, if it gets into the sea at all, does so by the Indus drainage system. It must be remembered that, at the remote semi-historical age spoken of, the Satlej itself, and all the other rivers of that system, must have flowed far east of their present course.

There is nothing new in the hypothesis advanced. Peter the Great's Scotch surveyor found the Oxus flowing into the Caspian, which now flows into the Aral, though the old channel was rediscovered by the expeditions of Peter's last descendant. The westward movement of the Indus itself is graven on the rocks with more than an iron pen, beside the ruins of Alor, and is indeed matter of almost modern history.

KESWAL.

NOTES ON A COLLECTION OF BUTTERFLIES MADE IN BURMAH BETWEEN SEPTEMBER 1885 AND DECEMBER 1886.

BY LIEUT. E. Y. WATSON.

COMMUNICATED BY JAMES A. MURRAY, *Vict. Nat. Hist. Inst.*

THE butterflies in the following list were caught at Rangoon from September to December 1885, and again from May to September 1886, at Beeling, Upper Tenasserim, from January to April 1886; and at Poungadaw, Upper Burmah, during October and November 1886.

The majority of specimens were caught in the pineapple gardens at Rangoon. These gardens, which extend for three or four miles from Rangoon on either side of the Prome Road, contain a considerable amount of low scrub jungle, interspersed with trees, chiefly jack-fruit, and abound in butterflies, especially Hesperidæ.

Beeling is a village about sixty miles to the north of Moulmein. Here the jungle consists largely of bamboo, with a fair proportion of large trees. The butterflies caught comprise a considerable number of comparatively rare species, and some which, to the best of my knowledge, are as yet undescribed. The most prolific collecting

grounds were the beds of the small mountain streams, especially at the higher elevations.

Poungadow is a small village just across the old frontier, and about thirty miles to the north-west of Thayetmyo. Here the jungle consists almost entirely of low bushes, very inferior to either Rangoon or Beeling from a butterfly point of view, though owing to the difference in rainfall, several species occurred which were not obtained elsewhere.

In the following notes, where no remark is placed against a species, it may be presumed it occurs commonly at all three places, and where any one place is omitted, it is intended to imply that the species did not occur there to my knowledge :—

1. *Danais vulgaris*, Butler.
   Common at Beeling ; occurs at Rangoon but rarely.
2. *D. limniace*, Cramer.
3. *D. aglæa*, Cramer.
4. *D. aglæoides*, Felder.
   Males common at Rangoon and Beeling ; females rare.
5. *D. gautama*, Moore.
   One male. Beeling.
6. *D. septemtrionis*, Butler.
   Beeling, but not common.
7. *D. chrysippus*, Linnæus.
8. *D. genutia*, Cramer.
9. *D. hegesippus*, Cramer.
   Common at Rangoon ; not seen elsewhere.
10. *Euplœa rogenkoferi*, Felder.
    One male, Beeling.
11. *Euplœa margarita*, Butler.
    Occurs rarely at Rangoon and Beeling.
12. *Euplœa crassa*, Butler.
    One female at Beeling.
13. *Euplœa erichsonii*, Felder.
    Common at Beeling; rare in Rangoon.
14. *E. rhadamanthus*, Fabricius.
    Not uncommon at Beeling ; females rare.
15. *E. castlemani*, Felder.
    One specimen seen in Rangoon flying among the tree-tops. Three or four Rangoon caught specimens in the Museum at Rangoon.

16. *E. midamus*, Linnæus.
17. *E. modesta*, Butler.
    One male at Beeling.
18. *E. godartii*, Lucas.
19. *E. subdita*, Moore.
    One male, Beeling.
20. *E. alcathœ*, Godt.
    Moderately common, Beeling.
21. *E. limborgii*, Moore.
    Rare at Beeling.
22. *E. grotei*, Felder.
    One male, one female, Beeling.
23. *E. hopei*, Felder.
    Beeling, one male.
24. *Mycalesus anaxiordes*, Marshall.
    Beeling, rare.
25. *M. medus*, Fabricius.
26. *M. runeka*, Moore.
27. *M. blasius*, Fabricius.
28. *M. mineus*, Linnæus.
29. *M. perseus*, Fabricius.
30. *M. malsara*, Moore.
    Rangoon and Beeling, common.
31. *Lethe mekara*, Moore.
    Two males, one female, Beeling.
32. *L. europa*, Fabricius.
33. *L. rohria*, Fabricius.
    Beeling, not common.
34. *Zophœssa, sp.*
    Poungadaw one specimen, very much battered, probably *Z. yama*, Moore.
35. *Yphthima philomela*, Johansen.
36. *Y. avanta*, Moore.
    Beeling, one male.
37. *Y. huebneri*, Kirby.
38. *Erites angularis*, Moore.
    Beeling, not uncommon at moderate altitudes, but very difficult to catch, as it is only found in thick bamboo jungle. I found the best plan to have them driven towards me.

39. *Melanitis leda*, Linnæus.
40. *M. aswa*, Moore.
41. *M. bela* Moore.
    Beeling, not common.
42. *M. ismene*, Cramer.
43. *Elymnias undularis*, Drury.
    Beeling, common. Rangoon, rarely.
44. *E. leucocyma*, Godt.
    Beeling, one male, one female.
    Poungadow, one female.
45. *Dyctis vasudeva*, Moore.
    Beeling, one specimen.
46. *Discophora tullia*, Cramer.
47. *Ergolis merione*, Cramer.
48. *E. ariadne*, Linnæus.
49. *Euripus halitherses*, Doubleday. Hewitson.
    Beeling, one female.
50. *Cupha erymanthis*, Drury.
51. *Atella sinha*, Kollar.
    Beeling, a few specimens.
52. *A. phalanta*, Drury.
53. *A. alcippe*, Cramer.
    Beeling, not uncommon.
54. *Cethosia cyane*, Drury.
    Beeling, Rangoon, common.
55. *Cethosia biblis*, Drury.
    Beeling, common.
56. *Cynthia erota*, Fabricius.
    Beeling, one female.
57. *Precis iphita*, Cramer.
58. *Junonia asterie*, Linnæus.
59. *J. almana*, Linnæus.
60. *J. atlites*, Linnæus.
61. *J. lemonias*, Linnæus.
62. *J. hierta*, Moschler.
63. *J. orithya*, Linnæus.
64. *Neptis hordonia*, Stoll.
65. *Neptis plagiosa*, Moore.
    Beeling, common.
66. *Neptis varmona*, Moore.

67. *Neptis kamarupa*, Moore.
Rangoon. Beeling, not uncommon.

68. *Neptis adipala*, Moore.
Beeling, one specimen.

69. *Neptis ophiana*, Moore.
Beeling, a few specimens.

70. *Neptis martabana*, Moore.
Poungadaw, one specimen.

71. *Neptis jumba*, Moore.

72. *Cirrhrochroa mithila*, Moore.
Beeling, not uncommon. Occurs rarely at Rangoon.

73. *Hypolimnas bolina*, Linnæus.
Common everywhere. *H. missipus* not seen.

74. *Penthema darlisa*, Moore.
Beeling, one specimen.

75. *Parthenos gambriseus*, Fabricius.
Var. *apicalis* not uncommon, Rangoon and Beeling.

76. *Lebadea attenuata*, Moore.
Beeling, common.

77. *Limenitus procris*. Cramer.
Rangoon, Poungadaw, common.

78. *Athyma inarina*, Butler.
Rangoon, one specimen, female.

79. *Athyma perius*, Linnæus.

80. *Athyma krisna*, Moore.
Poungadaw, one specimen.

81. *Symphœdra dirtœa*, Fabricius.
Poungadaw, common.

82. *Euthalia lepidea*, Butler.
Rangoon, Beeling, common.

83. *Euthalia xiphiones*, Butler.
Beeling, one female.

84. *Euthalia gahnu*, Moore.

85. *Euthalia kesava*, Moore.
Rangoon, Beeling, common.

86. *Euthalia discispilota*, Moore.
Beeling, a few specimens.

87. *Euthalia garuda*, Moore.
Rangoon, Beeling, common.

88. *Euthalia lubentina*, Cramer.
Rangoon, not common.
89. *Euthalia anosia*, Moore.
Beeling, one female.
90. *Rhinopalpa vasuki*, Doherty.
Beeling, two specimens.
91. *Cyrestis nivea*, Linken-sommer.
Beeling, common.
92. *Cyrestis risa*, Doubleday. Hewitson.
93. *Kallima inachis*, Boisduval.
Beeling and Poungadaw rarely.
94. *Charaxes athamas*, Drury.
95. *Zemeros flegyas*, Cramer.
Rangoon and Beeling, common.
96. *Abisara angulata*, Moore.
Beeling, not uncommon.
97. *Curetis sp.*
Common, Rangoon, Beeling.
98. *Gerydus biggsii*, Distant.
One specimen, Beeling.
99. *Paragerydus boisduvalii*, Butler.
Common, Poungadaw, Beeling.
100. *Paragerydus sp.*
One specimen, Rangoon.
101. *Allotinus unicolor*, Felder.
Very common at Rangoon.
102. *Spalgis epius*, Westwood. } Common,
103. *Neopithecops zelmora*, Butler. } Rangoon, Beeling.
104. *Cyaniris placida*, Moore.
Beeling.
105. *C. transpectus*, Beeling.
106. *Chilades varunasia*, Moore.
107. *C. laius*, Cramer.
108. *C. putli*, Kollar.
109. *Chilades sp.*
Poungadaw.
110. *Castalius rosimon*, Fabricius.
Rangoon, Beeling.
111. *C. ethion.* } Rangoon, Beeling.
112. *C. roxus*, Godt. } Poungadaw, not common.

113. *C. elna*, Hewitson.
Poungadaw.
114. *Castalius sp.*
Rangoon.
115. *Zizera karsandra*, Moore.
116. *Z. pygmæa*, Snelein.
117. *Z. sangra*, Moore.
118. *Nacaduba ardates*, Moore.
119. *N. cœlestis*,
Beeling.
120. *N. kerriana*, Distant
Beeling, one specimen.
121. *Nacaduba sp.*
Beeling.
122. *Nacaduba sp.*
Rangoon, Beeling.
123. *Nacaduba sp.*
Rangoon, Beeling.
124. *Nacaduba sp.*
Near Beeling.
125. *Jamides bochus*, Cramer
Rangoon, Beeling, not common.
126. *Catochrysops*,
127. *Catochrysops strabo*, Fab.
128. *Lampides ælianus*, Fab.
130. *Lampides elpis*, Godt.
131. *Lampides sp.*, Beeling, not common.
132. *Polyomınatus boeticus, Linn.*
133. *Megisba mahya.*
Beeling.
134. *Lycaenestes sp.*
Rangoon and Beeling, rare.
135. *Darasana paramuta.*
Rangoon, one specimen.
136. *Horaga sikkima*,
137. *Horaga sp.*
Common.
138. *Horaga lisides.*
Beeling, one specimen.
139. *Myrina lapithis*, Moore.

140. *Spindasis lohita*, Horsf.
Rangoon, Beeling, common.
141. *Spindasis sp.*
Poungadaw, one specimen.
142. *Satadra ælea*
Rangoon, rare.
143. *Tajuria mantra*, Feld.
Beeling, one specimen.
144. *Tajuria sp.* (*longinus* ?)
Poungadaw, one specimen.
145. *Iolaus anysis*,
Beeling, one specimen.
146. *Cheritra jaffra*. Horsf.
Rangoon, Beeling, common
147. *Sithon jangala*.
Pegu, Rangoon, common.
148. *Hypolycæna etolus*, Fabr.
Beeling, rare.
149. *Nilasera centaurius*, Fabr.
Rangoon, Beeling, common.
150. *Narathura ameria*, Hew.
Beeling, a few specimens only.
151. *Narathura sp.*
Beeling, rare.
152. *Narathura, sp.*
Beeling, rare.
153. *Surandra quercitorum*, Moore.
Rangoon, not uncommon.
154. *Rapala orseis*, Hewitson.
Rangoon, a few specimens.
155. *Rapala schistacea*, Moore.
Rangoon, Beeling, a few only.
156. *Rapala amisena*, Hewitson.
Rangoon, two specimens.
157. *Rapala sp.*
Rangoon, not uncommon, but local.
158. *Baspa melampus*, Cramer.
159. *Vadebra petosiris*, Butler.
Rangoon, Poungadaw.
160. *Loxura atymnus*, Cramer.

161. *Thamala miniata.*
Beeling, rare.
162. *Nychitona xiphia*, Fabr.
163. *Delias hierta* (var *indica*), Hubner.
164. *Delias agostina*, Hewitson.
Common at Beeling and Poungadaw.
165. *Delias pasithæ*, Linnæus.
Common at Beeling.
166. *Catopsilia catilla*, Cramer.
167. *Catopsilia crocale*, Cramer.
168. *Catopsilia pyranthe*, Linnæus.
169. *Terias hecabe*, Linnæus.
170. *Terias sari*, Horsfield.
171. *Terias harina*, Horsfield.
Common at Beeling, occurs at Rangoon.
172. *Terias sp.*
Beeling, rare.
173. *Terias, sp.*
Rangoon, one specimen.
174. *Terias, sp.*
Beeling, common.
175. *Terias, sp.*
Poungadaw, common.
176. *Terias læta*, Boisduval.
Only seen once on the Sittang river in N. Tenasserim.
177. *Ixias pyrene*, Linnæus.
178. *Ixias sp.*
Beeling, common.
179. *Catophaga hippoides.*
Rangoon, Beeling, common.
180. *Catophaga, sp.*
Beeling, rare.
181. *Appias libythea*, Fabr.
Beeling, rare.
182. *Huphina phrynne*, Fabricius.
Common.
183. *Huphina lea*, Doubl.
Rangoon, a few specimens.
184. *Huphina sp.* Poungadaw, common.

185. *Huphina sp.*
Poungadaw, common.
186. *Pieris soracta,*
Rangoon, Beeling, not common.
187. *Hebomoia glaucippe,* Linnæus
188. *Nepheronea gœa,* Felder.
189. *Ornithoptera pompeus,* Cramer.
Common at Beeling and Poungadaw.
190. *Papilio antiphates,* Cramer.
Beeling, common.
191. *Papilio sarpedon,* Linnæus.
Beeling.
192. *Papilio eurypylus,* Linnæus.
Beeling, common
193. *Papilio agamemnon,* Linn.
194. *Papilio erithonius,* Cramer.
195. *Papilio helenus,* Linnæus
Rangoon, rare.
196. *Papilio pammon,* Linnæus.
197 *Papilio doubledayi,* Wallace.
Rangoon. Beeling common,
198. *P. aristolochia,* Fabricius.
199. *P. androgeus,* Cramer.
Rangoon, Beeling, common.
200. *P. panope,* Linnæus.
Rangoon, Beeling, common.
201 *P. dissimilis,* Linnæus.
Rangoon, Beeling, common.
202. *Papilo sp.*
Beeling, a few specimens.
203. *Leptocircus virens.*
Beeling, common.
204. *Badamia exclamationis,* Fabr.
205. *Choaspes harisa,* Moore.
Rangoon, Beeling, common.
206. *Hasora badra,* Moore.
Rangoon, common.
207. *Hasora chromus,* Cramer.
Rangoon, rare.
208. *Paduka glandulosa,* Distant. Beeling, one specimen.

209. *Matapa aria*, Moore
210. *Pithauria murdava*, Moore.
Beeling, a few.
211. *Chapra matthias*, Fabr.
212. *Chapra sp.*
213. *Parnara semamora*, Moore.
Beeling, rare.
214. *Parnara austeni*.
Rangoon, common.
215. *Parnara sp.*
Poungadaw, rare.
216. *Parnara sp.*
Rangoon, common.
217. *Telicota bambusa*, Moore.
Beeling, rare.
218. *Padmona goloides*, Moore.
219. *Padmona dara*.
220. *Padmona palmarum*.
Beeling, rare.
221. *Padmona sp.*
Beeling, two specimens.
222. *Ampittia maro*, Fabricius.
223. *Satarupa bhagava*, Moore.
224. *Thanaos indistincta*, Moore.
225. *Tagiades ravi*, Moore.
226. *Tagiades pralaya*, Moore.
227. *Abaratha vasava*, Moore.
Beeling, rare.
228. *Abaratha sura*, Moore.
229. *Gangara thyrsius*, Fabr.
230. *Hyarotis adrastus*, Cramer.
Poungadaw, rare.
231. *Coladenia dan*, Fabr.
232. *Udaspes folus*, Cramer.
233. *Plesioneura alysos*, Moore.
234. *Plesioneura asmara*, Butler.
235. *Plesioneura aurivitata*, Moore.
Beeling, rare.
236. *Astictopterus salsala*, Moore.
237. *Astictopterus subfasciata*.

238. *Astictopterus olivascens.*
Beeling, rare.
239. *Astictopterus zamites*, Butler.
240. *Astictopterus diocles*, Moore.
241. *Halpe beturia*, Hewitson.
242. *Halpe sp.*
Rangoon, rare.
243. *Halpe sp.*
Rangoon, rare.
244. *Suastes aditus.*
245. *Saragesa dasahara*, Moore.
246. *Taractocera sagara.*
247. *Hesperia sp.*
Poungadaw, rare.
248. *Baracus septentrionum.*
Beeling,, rare
249. *Isoteinon cephala,*
Beeling, rare.
250. *Isoteinon atkinsoni*, Moore.
Rangoon, common.
251. *Isoteinon sp.*
Beeling, rare.
252 *Isoteinon sp.*
Beeling, rare.

NOTE ON *VIGNA VEXILLATA.*

By the Rev. A. G. Cane.

Visitors to Matheran will have noticed here and there growing beside the pathway on the hill in October the sweet pea or *Vigna vexillata*, but no botanist seems to have noticed the ingenious contrivance by which it secures the fertilization of the flower.

When in full bloom it is of a pale violet colour with deeper shades on certain parts of the petals. The centre of the flower has a couple of yellow spots reminding one of the Heartsease.

The stamens and pistil are hidden from view; these are enclosed in the keel on the flower's right side below. This sheath-like keel is in the form of a panther's claw, pointing towards the centre of the flower. At the end of the claw is a small aperture, whilst near the base in front and under one of the alæ of the flower is a prominent hump. The carpel lies along the inside of the convex curve of the

sheath, having a distinct bend inwards about the middle of the curve; this bend acts as a powerful lever on the style. The stigma is found just inside the aperture at the end. The pistil is arranged as in the pea and is inside the sheath.

Having thus described the flower we will see how all these appliances are brought into play for the purpose of fertilization. The insect in search of honey makes for the yellow centre of the flower, alighting on the lip or alæ which lies on the hump. Forcing its head into the centre of the flower, all its weight is exerted in pressing down the hump, which acts on the lever in the carpel and forces the style so far through the aperture as to cause the stigma to rub against the insect's back, and so obtain the pollen which has been brought from another flower. On the insect retiring the style springs back again into its place.

But if we look again at the sheath we find that the aperture is too small to admit of the stamens protruding at the same time as the pistil, but become crowded together inside the opening of the sheath.

Here another curious contrivance is provided. Along the end of the style on the inside of the curve, after the stigma, is placed a brush with the hairs projecting outwards. As the style projects this brush carries off the pollen from the anthers and leaves it on the insect's back to fertilize the next flower it may visit. During my short stay at Matheran I did not have an opportunity of noticing an insect visit one of these flowers, but the projecting style curves so exactly over the spot where the insect would be situated to secure the honey that there seems but little doubt that this is the process that is gone through.

Any one taking one of these flowers in the hand and depressing the keel only as much as would be done by a bee at work will notice the end of the pistil suddenly appear to the extent of nearly half an inch, bringing with it the brush charged with yellow pollen, which it has carried with it on its way through the opening in the sheath.

It would be interesting if any one could prove by observation that my conjecture is a correct one.

A. G. CANE.

Since writing the above, Dr. T. Cooke has pointed out to me that Prof. Müller in his "Fertilization of Flowers," has remarked on all these peculiarities of the papilionaceæ, but Müller says: "In all these groups, the stigma and the pollen are applied to the *under* side of the bee," which leads me to think that this particular flower has not come under the Professor's notice.

MARATHI NAMES OF PLANTS.

WITH A GLOSSARY.

By Brigade-Surgeon W. Dymock.

(*Continued from page* 242.)

Paspalum scrobiculatum, *Linn.*	(wholesome). गोडा हरिक or कोद्रू Gorá harik or kodrú (poisonous), माजराहारिक or कोद्रू Majara harik or kodrú.
Pastinaca glauca	*See* Peucedanum Dhana, var. Dalzellii.
,, grandis	*See* Peucedanum grande.
,, Shekakul	*See* Tordylium Shekakul.
Pavetta indica, *Linn*.....	पापटी Pápti.
Pavonia odorata, *Willd*.....	काळावाळा Kálá válá, वाळा Válá.
Pedalium Murex, *Linn*.....	करोंटा Karontá, गोक्षुर or-क Gokhsúr or Gokhsúrak, माळविगोखरु Málvigokhrú.
Peganum Harmala, *Linn*.....	हुर्मल Húrmal, इस्पंद् Ispand.
Penisetum aureum.....	मूलतोम Múltom.
,, cenchroides, *Rich*...	धामन Dháman.
,, typhoideum, *Rich.*	बाजरी Bájri, सजगुरा Sajgúrá.
,, ,, var.....	डांगळी Dángli.
Pentapetes phœnicea, *Linn* ...	तांबडी दुपारी Támbari dúpári, दुपारी Dúpári.
Pentaptera	*See* Terminalia.
Pentatropis microphylla, *W. and A.*	सिंगरोटा Singrotá.
Perilla ocimoides, *Linn*.....	पांगळी Pángali.
Periploca aphylla, *Dcne.*	रानशेर Ránsher, बराई Barai.
Peristrophe bicalyculata, *Nees*	घाटी पित्तपापडा Ghátí pittpápará.
Petrea volubilis, *Jacq.*	विलायती उक्षी Vilayati úkshi.
Peucedanum grande, *C. B. Clarke.*	बाफळी Báphali.
,, graveolens, *Benth.*	अतिछत्रा Atichhattra, शेपू Shépú.
,, Dhana, *Dalz.*	कोलंद Koland.
Phalaris muricata	धरचारो Dharcháro.
Phaseolus aconitifolius, *Jacq*...	मठ Math.
,, adenanthus, *G. F Meyer.*	हलाउद Halaud.
,, Mungo, *Linn*, variety	काळेमूग Kálémúg, उडीड Urid.
,, pauciflorus, *Dalz* ...	रानमूग Ránmúg.
,, radiatus.....	मूग Múg, P. Mungo ; *Linn.* var. radiatus.
,, tribolus, *Ait*.....	जंगलीमठ Jangli math, मुकण्या Múknyá, अर्कमठ Arkmath.

Phaseolus trinervius, *Heyne* ...	मूकनी Mukni, मटकी Matki, मुंगीर Múngir.
Phaylopsis parviflora, *Willd*...	वायटी Vayati, रानमाउशी Ránmaushi, वाहिटी Wahití.
Phœnix dactylifera *Linn.* (fruit),	खुरमा Khúrmá, खारीक Khárik (*impd.*)
„ sylvestris, *Roxb.*	शिंदी Shindi, खजूर Khajúr.
„ „ (fruit).	खारीक Khárik.
Phrynium capitatum, *Willd*...	कुडाळी Kúdáli.
„ dichotomum, *Roxb.*	पाटी Páti.
Phyllanthus distichus, *Müll-Arg.*	रायआंवळा Raiávala, हरफारेवडी Harpharévari.
„ Emblica, *Linn*....	अंवळ or आंवळा Avala or Ávala, आमलक Ámalaka, आंवळकाठी Ávalkáthi,
„ lanceolarius, *Müll-Arg.*	भोमा Bhomá.
„ madraspatensis, *Linn.*	कनोछा Kanochhá.
„ Niruri, *Müll-Arg*..	भुई आंवळी Bhui ávali.
„ reticulatus, *Poiret.*	पावन or पुंवण, Pávan or Púvan.
„ retusus, *Roxb*.....	*See* Securinega Leucopyrus.
„ turbinatus	कांटे पुंवण Kántépuvan, Melanthesa turbinata, *Wight.*
„ urinaria, *Linn.* ...	लाल भुई आंवळी Lál bhui ávali.
Physalis Alkakengi, *Willd.* ...	काकनज् Káknaj.
„ indica, *Lam*.....	चिरबुटली or चिरबोटी, Chirbútli or chirboti.
„ minima, *Linn.* var. *indica.*	थानमोडी Thánmori.
„ peruviana, *Linn.*	पोपटी Popti, टंकारी Tankári.
„ somnifera.....	*See* Withania somnifera.
Picrorhiza Kurroa, *Royle* (rhizome)	कुटकी Kútki, बालकडू Balkaru (*impd.*)
Pimpinella Anisum, *Linn*.....	अनीसून Anisún, एरवाडोसे Erva doce (*Port.*) (*impd.*)
„ monoica	भालगा Bhálgá
Pinellia tuberifera, *Tenore* (tubers).	झरावंदेगिरद् Zarávandégird (*false, impd.*)
Pinus Deodara, *Loud.* (wood)	देवदार Deodár, तेल्यादेवदार Teliyádeodár (*impd.*)
„ Gerardiana, *Wall.* (nuts).	चिलघोझा Chilghozá (*impd.*)
„ longifolia, *Roxb.* (turpentine)	गंधाबिरोझा Gandhábirozá, चीरेल Chirel (*impd.*)
Piper Betle, *Linn.*	पानवेल Pánvel, नागवेल Nágvel, कापूरवेल Kápúravel.

Piper Chaba, *Bl.*	चवक Chavek.
„ Cubeba, *Linn. f.* (fruit).	कांकोळी Kánkoli, कबाबचिनी Kabábchini (*impd.*)
„ longum, *Linn.*	बंगाली पिपली Pipli, Bengáli,
„ „ (root)	पिपली मूळ Pipli múl.
„ nigrum, *Linn.*	काळी मिरी Káli miri.
„ officinarum *C.D'C.* (long-pepper)	मोठी पिपली Mothi pipli.
„ sylvestris	डोंगरीमिरची Dongri mirchi.
„ trioicum	कोकरवेल Kokarvel, P. nigrum, *Linn.* var. trioicum.
Pisonia morindifolia, *Plum.* ..	चिनई सालिट Chini sálít.
Pistacia cabulica, *Stocks* (resin)	मस्तकी Mastaki (*impd.*)
„ integerrima, *Stewart.* (galls).	काकडशिंगी Kákaráshingi (*impd.*)
„ Lentiscus, *Linn.* (resin).	रुमी मस्तकी Rúmi mastaki (*impd.*)
„ vera, *Linn.* and Pistacia Khinjuk, *Stocks* (galls	गुलपिस्ता Gùlpistá, बुझगंज Buzganj (*impd.*)
„ „ (nuts) ...	पिस्ता Pistá (*impd.*)
Pistia stratiotes, *Linn.*	प्रश्नी Prashni, गोंडाल Gonḍála, शेडवेल Shervel.
Pisum arvense, *Linn.*	कलाई Kalai.
„ Sativum, *Linn.*.....	वाटाणा Watáná.
Pithecolobium bigeminum, *Benth.*	कचलोरा Kachlorá.
Pithecolobium dulce, *Benth.*...	विलायती चिंच Viláyati chinch.
Pittosporum floribundum, *W. & A.*	वेहकळी Vehkḷi.
Plantago Ispaghula (seed).....	इस्पघूल् Ispaghúl. P. ovata, *Forsk.* (*impd.*)
„ major, *Linn.* (seed) ...	बारतंग Bártang (*impd.*)
Platanthera Susannæ, *Lindl.*..	कालाबी Kálábi.
Plectranthus incanus, *Link*....	लाल आघाडा Lal ágháŕá.
Plectronia didyma, *Hook. f.*...	अरसल Arsul.
Pluchea lanceolata, *Oliv.*	पातीरास्ना Pátirásná.
Plumbago capensis, *Spr*.....	उदीचित्रक Udi chitrak, काळाचित्रक Kálachitrak.
„ coccinea, *Boiss*.....	लालचित्रक Lál chitrak.
„ zeylanica, *Linn*.....	चित्रक Chitrak.
Plumeria acutifolia, *Poiret.* ...	खैरचंपा or खुरचाफा, Kháirchampá or khúrcháphá.
Poa cynosuroides	*See* Eragrostis cynosurioides, *Retz.*
Pogostemon Patchouli, *Pelle.*	पांच Pánch, मालीपांच Málipánch.
„ purpuricaulis ..	पांगळा Pánglá, P. parviflorus, *Benth.*

Poinciana elata, *Linn*.....	संदेसरा Sandesrá.
,, pulcherrima	*See* Cæsalpinia pulcherrima.
,, regia, *Bojer*	गुलतुरा Gúltúrá, गुलमोहर, Gúlmohar, कुंकुम-केशर Kúmkúmkéshar.
Polyalthia cerasoides, *Benth.* and *H. f.*	हुम Húm.
,, longifolia, *Benth. H. f.*	जांभुळदेवदार Jámbhúl deodár.
Polyanthes tuberosa, *Linn.* ...	गुलछडी Gúlchhari, गुलशबू Gúlshabú.
Polygala chinensis, *Linn.*	नेग्ली Négli.
Polygonum aviculare, *Linn.* ...	केशरी बंदक Keshri-bandak.
,, chinense, *Linn.* ...	परळ Paral.
,, glabrum, *Willd* ...	रक्तरोहिडा or रक्तरोंडा, Raktarohidá or rák-trorá.
Polypodium quercifolium, *Spr.*	अश्वकातरी Ashvakátri, बाशिंग Báshing.
,, vulgare, *Linn.* ...	बिसफैज Bisfaij (*impd.*)
Polyporus officinalis, *Fries*.....	घारीकून् Ghárikün.
Pongamia glabra, *Vent*.....	करंज or करज, Karanj or karaj, सुखचैन Súkh-chain.
Populus euphratica, *Oliv*.....	भान or बहान, Bhán or bahán. (The Sind boxes are made of the wood.)
Porana racemosa	भौरी Bhauri, गरीया Gariyá. P. malabarica, *Clarke.*
Porphyra vulgaris, *Ag*.....	लस Las.
Portulaca oleracea, *Linn.*	कुर्फा: Kúrfah, मोठी घोळ Mothí ghoḷ.
,, quadrifida, *Linn.* ...	रानघोळ Ránghoḷ, रायघोळ Raighoḷ, चिलघोळ Chilghol.
,, tuberosa, *Roxb.*	लूनक् Lúnak.
Potomogeton pectinatus, *Linn.*	फास् Phás.
Pothos officinalis	*See* Scindapsus officinalis.
,, pertusa	*See* Scindapsus pertusus.
Prangos pabularia, *Lindlt.* (fruit).	फितुरासाल्यून Phitúrásályún (*impd.*)
Premna latifolia, *Roxb*.....	घनोरी or घनेरी Ghanori or ghanéri.
,, Nimmoniana.....	*See* Mappia tomentosa.
,, scandens, *Roxb.*	चंबरवेल Chambarvel, चंबारी Chambári.
,, serratifolia	खारा नरवेल Khárá narvel, अरण Aran. Premna integrifolia, *Linn.*
Procris ramiflora, *Lam*	खरगोळ Khargol.
Prosopis spicigera, *Linn.*	शमी Shami, समडी Samri, शमडा Shamrá, सवंदल Savandal, कनदी Kandi.
Prunus amygdalus, *Baillon*....	बदाम Badám.

Prunus armeniaca, *Linn.*	झरदाळू Zardálú.
,, bokhariensis	आलूबोखारा Alú bokhárá. P. communis *Huds.* var. insititia.
,, Mahalib, *Linn*.....	गवला Gavla, महालब Mahálab.
,, Puddum, *Roxb*.....	पद्मकाष्ठ Padmakáshta.
Psidium pyriferum.....	पेरु Perú. P. Guyava, *Raddi.*
Psophocarpus tetragonolobus, *Neck.*	चारपट्टी Chárpatti, चौधारी Chaudhári.
Psoralea corylifolia, *Linn*.....	बावंची Bávanchi.
Pteris aquilina	नेत्सा Nétsá.
Pterocarpus Marsupium, *Roxb.*	बिबला Bibla, होनी Honi, आसन Ásan.
,, santalinus, *Linn.f*	रक्तचंदन Rakta chandan, रतांजळी Ratánjli.
Pterospermum acerifolium, *Willd.*	कणक-चंपा Kunak-champá, करणीकारा Karnikárá.
,, suberifolium, *Lam.*	मुचकुंद Múchakúnd.
Ptychotis ajowan	*See* Carum copticum.
Puneeria coagulans	*See* Withania coagulans.
Punica Granatum, *Linn*.....	अनार Anár, डाळिंब Dálimb.
,, ,, (double flowers).	गुलनार् Gúlnár.
Putranjiva Roxburghii, *Wall.*	जीवनपुतर Jivanputra.
Pyrethrum indicum	*See* Chrysanthemum indicum.
Pyrus Cydonia (seed)	*See* Cydonia vulgaris.
Pythonium Wallichianum, ... *Schott.*	शेवाळें Sheválé. This term (Linga temples) is applied to Arum flowers generally.
Quercus infectoria, *Oliv.* (gall.)	माजूफळ Májúphal, माया Máyá.
Quisqualis indica, *Linn*.....	विलायती चमेली Viláyati chaméli.
Randia dumetorum, *Lam*.....	गेळ Gél, गेळफळ Gelaphal, पेरअळु Peralu, मिंधळ Mindhal, मोनींगेळी Monigeli.
,, uliginosa, *D. C*.....	पेंढारी Pendhári, पेंद्रू Pendhrú, पेंढर Pendhar.
Raphanus sativus, *Linn.*	मुळा Múlá.
,, ,, var. caudatus..	मोगरी Mogri.
Rauwolfia serpentina, *Benth*...	हर्कय or हडकी, Herkai or harki.
Reinwardtia trigyna, *Planch* ..	अबई Abai.
Remusatia vivipara, *Schott.*	रुखाळू Rúkhálú.
Rhamnus Wightii, *W. & A.* ...	रक्तरोहिडा or रक्त्रोडा, Raktarohidá or raktrora.
Rhazya stricta, *Dene.*	सेवर Sevar.
Rheum officinale, *Baill*.....	रेवन खताई Revan khatai.
Rhinacanthus communis, *Nees*	गजकर्णी Gajkarni.
Rhizophora mucronata, *Lam.*,	कांदळ Kándal.

Rhus coriaria, *Linn.* (fruit) ...	सिमाक् Simák (*impd.*)
Ricinus communis, *Linn.*	एरंडी Erandi.
Rivea ornata, *Chois.*	फांद Phánd.
,, hypocrateriformis, *Chois.*	कलमीलता Kalmilatá.
Rosa damascena, *Mill.*	गुलाबाचें झाड Gúlába-che-jhár.
,, glandulifera, *Roxb.*	कांटेशेवती Kantéshevati.
Rostellularia procumbens	*See* Justicia procumbens.
Rottlera dicocca, *Roxb.*	पेटारी Petári.
,, tinctoria	*See* Mallotus philipensis.
Rourea santaloides, *W. & A.* ...	वर्धारा Vardhárá.
Rubia cordifolia, *Linn*	मंजिष्ट Manjishta, इतारी Itári.
Rubus lasiocarpus, *Smith.*	गौरीफळ Gauriphal.
Ruellia glutinosa...	*See* Strobilanthes glutinosus.
,, imbricata	*See* Phaylopsis parviflora.
,, infundibuliformis	*See* Crossandra undulæfolia.
Rumex sp. (fruit)	गुल्हमझ् Gulhamaz (*impd.*)
,, vesicarius, *Linn*.....	चुका, चाकवत, or चाकोता, Chúká, chákwat, or chákotá.
Rungia repens, *Nees*	घाटी पित्तपापडा, Ghati pitpápará.
Ruta graveolens, *Linn.* var. angustifolia.	सुदाब् Súdáb. Corrupt form in Marathi सुताप Sútáp.
Saccharum Munja	सर् Sar, सिरकी Sirki. S. Sara, *Roxb.*
,, officinarum, *Linn.*.	ऊस Us.
,, spontaneum, *Linn.*.	कंगरा Kangará, काश Kásh, बरू Barú.
Saccopetalum tomentosum, *H. f. & T.*	किर्नी Kirni, करी Kari, हूम Hum.
Sagenia coadunata.....	काजऱ्याचें वाशींग Kajriyachè bashing. Beach fern.
Sageræa laurina.....	*See* Bocagea Dalzellii.
Sageretia Brandrethiana. *Aitch.*	गांगर Gángar.
Sagittaria obtusifolia, *Linn* ...	नलकूट Nalkút.
Salacia prinoides, *D. C.*.....	निसळबोंडी Nisalbondi.
Salix caprea, *Linn*.....	बेदमुष्क Bedmúshk (*impd.*)
,, tetrasperma, *Roxb.*	वालुंज Válúnj, बीतसा Bitasá.
Salmalia malabarica	*See* Bombax malabaricum.
Salsola fruticosa	*See* Suæda fruticosa.
Salvadora oleoides, *Dcne.*	खांखिण Khákhin.
,, persica, *Garcin.* ...	खांखिण Khákhin, पीलू Pilú.
Salvia plebeia, *R. Br.*	कमरकस Kamarkas.
Sanseviera Roxburghiana	घनसफन Ghanasphan, गोकर्ण Gokarna. S. zeylanica, *Willd.*

Santalum album, *Linn.*	चंदन Chandan.
Sapindus trifoliatus, *Linn*	रिठा Rithá.
Sapium baccatum	*See* Excœcaria baccata.
,, sebiferum	*See* Croton sebiferum.
Sapota tomentosa	*See* Sideroxylon tomentosum.
Saraca indica, *Linn*.....	अशोक Ashok, ओसग Aosag, असूपाला Asúpálá.
Sarcostemma brevistigma, *W. & A.*	सोमवेल Somvel.
,, viminale	फोक Phok. S. intermedium, *Dcne.*
Sauromatum pedatum, *Schott.*	लोट Loth, भस्मकंद Bhasmkand.
Saussurea Lappa, *C. B. Clarke*	कुष्ट Kusht, उपलेट Upalét, चोख Chokh.
Scævola Kœnigii, *Vahl.*	भद्रक Bhadrak.
Schleichera trijuga, *Willd.* ...	कोशिंब Koshimb, कुसंब Kúsamb.
Schrebera Swietenioides, *Roxb.*	मोकडी Mokarí, मोख Mokh.
Schweinfurthia sphærocarpa, *A. Braun.*	संनिपात् Sanipát.
Scilla hyacinthoides, *Linn.* ...	भुईकंद Bhuikand.
,, indica	*See* Urginea indica.
Scindapsus officinalis, *Schott.*,	गज पिंपळी Gajpimpali.
,, pertusus, *Schott*....	गणेशकंद or गणेशवेल, Ganeshkand or ganeshvel.
Scirpus Kysoor, *Roxb.*	कचर Kachará, फुरवीण Phúrvin.
,, subulatus, *Vahl.*	लवाळा Laválá.
Scolopia crenata.....	हिंतालू Hintálú.
Scutia indica, *Brogn.*	चिमट Chimat.
Securinega Leucopyrus, *Müll-Arg.*	वेडेंपुवण Vorepuvan.
,, obovata, *Müll-Arg.*	कोडरसी Kodarsi.
Semicarpus Anacardium, *Linn.*	बिब्बा Bibbá.
Sesamum indicum, *Linn.*	तीळ Til, मोठेतीळ Mothetil, मरढेतीळ Mardhétil.
Sesbania aculeata, *Pers.*, and procumbens, *W. & A.*	रानशेवरी Ránshevari.
,, ægyptiaca, *Pers.* ...	शेवरी Shevari, जयंती Jayanti.
,, grandiflora, *Pers.* ...	अगस्ती or अगस्तया, Agásti or agastiya, हदगा Hadgá.
Sesili indicum, *W. & A.*	किरमिंजी अज्वान Kirminji, Ajván.
Sesuvium portulacastrum, *Linn.*	धापा Dhápá.
Setaria glauca, *Beauv.*	कोलखिंदर Kolkhindar, कोलार Kolár, भादळी Bhádaḷi.
,, italica, *Kunth.*	काळी कांगणी Káli-kángani, कडवी कांगणी Karvi-kángani.

Setaria verticillata, *Beauv.* ...	कुत्र्याचीचार Kutriyachichar, पंधाड Pandhár.
Shorea robusta, *Gärtn.*	शाल Shál.
„ „ (resin.)	राळ Rál, डामर Damar (*impd.*)
Sida acuta	तुकटी Túkati, तुपकारिया Túpkariyá. S. carpinifolia, *Linn.*
„ cordifolia, *Linn*.....	चिकणा Chikná, लोबीरसीर भाजी Lobirsir-bháji.
„ rhomboidea, *Roxb*.....	सहदेवी Sahadevi, अतिबला Atibalá. S. rhombifolia, var. rhomboidea, *Linn.*
Sideroxylon tomentosum, *Roxb.*	कांटेकुंबळ Kánte-kúmbal.
Sinapis campestris	*See* Brassica campestris.
„ juncea	*See* Brassica juncea.
„ nigra	*See* Brassica nigra.
Sisymbrium Irio, *Linn.* (seeds).	खाक्षी Khákshi (*impd.*), रानतिकी Rántiki.
Smilacina fusca	झीप्रीगाठी किराईत Jhiprigáthi, Kiráit.
Smilax China, *Linn*	चोबचिनी Chobchini (*impd.*)
„ officinalis, *Humb. et Bonpl.*	विलायती सालिस Viláyeti-sális.
„ ovalifolia, *Roxb.*	घोटवेल Ghotvel, गूटी Gúti, हिण्यशाक Hinyasháka.
Smithia sensitiva, *Ait.*	कवला Kavalá.
„ blanda	मोठीबरकी Mothi-barki.
Solanum Dulcamara, *Linn*.....	अनबेसालब Anabesálab.
„ giganteum, *Jacq*.....	कुत्री Kútri, चीना Chiná.
„ indicum *Linn.*	रिंगणी Ringani, डोर्ली Dorli, चिंचुर्टी Chinchúrti.
„ Jacquini	भुईरिंगणी Bhuiringani, कांटेरिंगणी Kánteringani. S. xanthocarpum, *Schrad.*
„ lycopersicum	वालवांगी Válvángi, वेलवांगी Welvángi, Lycopersicum esculentum, *Miller.*
„ Melongena, *Linn*	बैंगण Baingan, वांगें Vángé.
„ nigrum, *Linn.*	कामुणी Kamuni, काकमाची Kakamachi.
„ trilobatum, *Linn*.....	मोठीरिंगणी Mothi-ringani.
„ tuberosum, *Linn*	बटाटा Batátá.
Sonneratia acida, *Linn. f.*	तिवर Tivar.
Sopubia delphinifolia, *G. Don.*	दुधाळी Dúdháli.
Sorghum saccharatum, *Pers*....	इम्फी Imphi.
„ vulgare, *Pers*.....	जोंधळा Jondhalá, जवारी Javári.
„ „ var.	सुंडिया Súndiyá, शाळू Shálú.
Soymida febrifuga, *Adr. Juss*...	रोहण Rohan, पोलारा Polárá.
Spatholobus Roxburghii, *Benth*	फलसन Phalsan.
Spermacoce hispida, *Linn*.....	मदनघंटी Madanaghanti, घंटीची भाजी Ghant che bháji, धोती Dhoti.

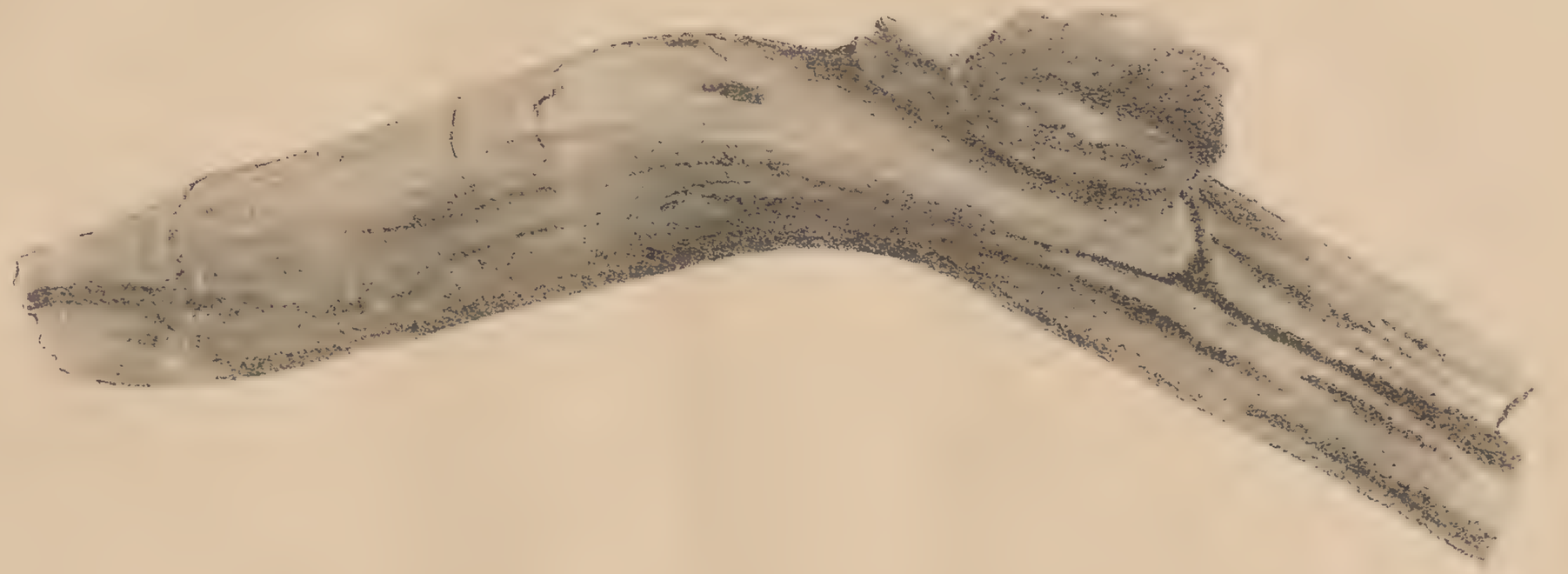
Sphæranthus indicus	मुंडी Múndi, गोरख मुंडी Gorakh múndi, खडक शेपू Kharak-shépú, नाई Nai.
Spilanthes Acmella, *Linn.* var. oleracea, *Clarke.*	अचरबोंडी Acharabondi.
Spinacia oleracea, *Mill*.....	पालक Pálak.
Spondias mangifera, *Pers*.....	अंबाडा Ambará, रानअंबा Ránambá, खटांबा Khatambá, दोळआंबा Doḷámbá, अमडा Amrá.
Sponia Wightii	कापशी Kapashi, खडगोळ Khargol. S. orientalis, *Planch.*
Stemodia ruderalis.....	*See* Lindenbergia urticæfolia.
Stephanotis floribunda, *Poir*....	मुगडीवेल Múgari vel.
Stephegyne parviflora, *Korth.*	कदंब Kadamb, हलवण Halavan, vulg. कलंब Kalamb.
Sterculia colorata, *Roxb*.....	खौशी Khaushi, भाईकोई Bhaikoi.
,, fœtida, *Linn.*	देवदार Deodár.
,, guttata, *Roxb.*	गोलदार Goldár, कुकर Kúkar.
,, urens, *Roxb*.....	पांढूक Pándrúk, कावळी Kávali, कांडूळ Kándul, करै Karai, सालधवल Sáldhaval.
,, ,, (gum)	करैगोंद Karaigond.
,, villosa, *Roxb*.	गुलखंदर Gúlkhandar, उदळ Udal.
Stereospermum chelonoides, *D.C.*	पाडळ Paraḷ.
,, suaveolens, *D. C.*	कालगोरी Kálgori, पाद्री Pádri, पाटला Pátalá.
Streblus asper, *Lour.*	खरोटा Kharotá, करेरा Karerá.
Strobilanthes ciliatus, *Nees* ...	कार्वी Kárvi, करा Karáv, कारव Kárav, कार्वी Kárvi.
,, glutinosus, *Nees.*	वायटी Vayati.
,, Heyneanus, *Nees.*	आकरा or अकरा Ákrá or akrá.
,, ixiocephalus, *Benth.*	कार्वी Karvi, &c.
Strœmeria tetrandra.....	*See* Cadaba indica.
Strychnos colubrina, *Linn*.....	काजरवेल Kájarvel, नागमुष्टी Nágamúshti, कनळ Kánal.
,, ,, (wood)...	गोहागरी लाकडी Gohágari lákari.
,, Ignatii, *Berg*	पपीता Papitá.
,, Nux-vomica, *Linn*...	काजरा Kájra, कुचला Kúchla.
,, Potatorum, *Linn. F.*	निवळी Nivaḷi, कतक Katak, चिलबिज Chilbiji निर्मळी Nirmali.
Stylodiscus trifoliatus.....	*See* Bischoffia javanica.
Styrax Benzoin, *dry and* (resin)	ऊद Ud, लोबान Lobán (*impd.*)
Suœda fruticosa, *Forsk*	लाना Láná, मोरस Moras.
,, nudiflora, *Moq*.....	मोरस Moras.

Swertia affinis, *Clarke*.....	सिलारस Siláras.
,, angustifolia, *Ham*	पहाडी किराईत Pahari kiráit.
,, Chirata, *Ham*.....	किराईत Kiráit.
,, corymbosa, *Wight*.....	कडवी नाई Karvi nai.
,, decussata, *Nimmo*.....	कडवी शिलाजीत Karvi shiláji t.
,, paniculata, *Wall*.....	कडवी नाई Karvi nai.
Symplocos racemosa, *Roxb*.....	लोध्र Lodhra, हुरा Húrá.
Synantherias sylvatica, *Schott.*	वज्रमूठ Vajr-múth, उझोमूठ Uzo-múth of Goa.
Syzygium Jambolanum	*See* Eugenia Jambolana.
,, salicifolium.....	*See* Eugenia lissophylla.
Tabernæmontana coronaria, *Br.*	तगर Tagar, नांदेट Nándét. (गणतगर Gantagar var. with large clusters of flowers.)
,, dichotoma, *Roxb.*	टिटल Ṭiṭal.
Tacca pinnatifida, *Forsk*.....	सरडेचामाड Sarḍechámár, देवकांदा Deokándá.
Tagetes patula.....	गुलझाफ्री Gúljáferi, मखमल Makhmal. रोइयाचें फूल Rozia chephul. T. erecta, *Linn.*
Tamarindus indica, *Linn*	अम्ली Amli, चिंच Chinch.
,, ,, (ripe pods).	अंबुरची चिंच Ambúr-chi-chinch.
Tamarix dioica, *Roxb.*	लाल झाऊ Lál jhau.
,, ericoides, *Rothb*.....	झाऊ Jhau, सरू Sarú.
,, gallica, *Linn.*	झाऊ Jhau.
,, ,, (galls)	मगियामाई Magiyá mai.
,, orientalis (galls)	मगियामाई Magiyá mai. T. articulata, *Vahl.*
Tapinocarpus indicus, *Dalz*....	डुकरमुंगळी Dúkarmúngli.
Taraxacum Dens-leonis	भुईपत्र Bhui patra. T. officinale, *Wiggers.*
Taxus baccata, *Linn.* (leaves)...	बर्मी Barmi (*impd.*)
Tecoma undulata, *G. Don*.....	रक्तरोहिडा or रक्तरोडा, Rakta rohida or raktrora.
Tectona grandis, *Linn.*	साग Ság.
Tephrosia purpurea, *Pers*.....	सरपुंखा Sarpúnkhá, उन्हाळी Unháli.
,, suberosa	*See* Mundulea suberosa.
Terminalia Arjuna, *Bedd*.....	अर्जुन Arjún, शार्दूल Shárdúl, पिंजळ Pinjal.
,, belerica, *Roxb*.....	बेहेडा Beherá, हेला Helá, हेलारी Helári, हिरडा Hiradá, एळा Ela.
,, Catappa, *Linn.* ...	बदाम Badám, बंगाली बदाम Bangáli badám.
,, Chebula *Retz.* ...	चाम्हारी हिरडा Chamhári hiradá, रंगारीहिरडा Rangárihiradá.
,, paniculata, *W.& A.*	किंजळ Kinjal, किंजुरा Kijúrá.
,, tomentosa, *W. & A.*	ऐन Ain, असण Asan, आईन Áin.
Tetrameles nudiflora, *R. Br*...	जंगली भेंडी Jangli bhendi.
Tetranthera apetala	*See* Litsæa tomentosa.
,, lancifolia	,, lanciſoliá.
,, monopetala	,, polyantha.

Tetanthera Roxburghii	*See* Litsaea sebifera.
Thalictrum foliolosum, *D. C*...	पियारंगा Piyaranga (*impd*).
Thespesia Lampas, *Dalz*	रानभेंडीचें झाड Rán bhendi che jhar.
„ populnea, *Corr*.....	भेंडीचें झाड Bhendi che jhar, पिंपरणी Pimparni, पिंपरी Pimpari.
Thevetia nereifolia, *Juss*	पिवळा कण्हेर Pivalá-kanher.
Thunbergia fragrans, *Roxb* ...	एरीवेल Erivel for वेडींवेल.
Tiaridium indicum, *Eriyel*.....	भूरुंडी Bhúrúndi. Heliotropium indicum, *Linn.*
Tinospora cordifolia, *Miers* ...	गुळवेल Gúlvel, अंबरवेल Ambarvel, अमरवेल Amarvel, अमृता Amritá, गरुडवेल Garúdvel, घरोळ Gharol.
Toddalia aculeata, *Pers*.....	मोडा आगेरु Morá-ágerú.
Tordylium Secacul, *Mill.*	शकाकुले मिस्री Shekákúlé misri.
Tradescantia axillaris, *Linn*...	इचका Ichka, काजळ Kájal.
„ discolor, *Willd*...	लाल कुवार Lál-kúvar.
Traga involucrata, *Mull-Arg*..	कुलती Kulti, कोलेती Koléti, थोरआग्या Thora ágiyá, कळावी Kalávi.
Trapfa bispinosa, *Roxb*.....	शिंघाडा Shinghárá.
Trewia nudiflora, *Willd*.....	पेटारी Petári.
Trianthema intermedia	वाहो Vaho. T. hydaspica, *Edgw.*
„ micrantha	फसरलानी Fasarláni. T. pentandra, *Linn.*
„ obcordata	खाप्रा Kháprá, नरमा Narmá. T. monogyna, *Linn.*
Tribulus terrestris, *Linn*.....	गोखरु Gokharú, सराटे or सरांटे Saráté or Saránté.
Trichodesma africanum, *Br*...	पाबरपानी Pábarpáni.
„ indicum, *Br*.....	जिंघी Ginghi, गावजबान Gaozabán.
Tricholepis glaberrima	मोठाबोर Motábor.
„ procumbens.....	*See* Volutarella divaricata.
Trichosanthes anguina, *Linn*...	परुळ Parúl, पडवळ Parval, पांदोळ Pándol.
„ cordata, *Roxb*.....	रानपडवळ Rán parval.
„ cucumerina, *Linn.*	कडूपडवळ Karúparval (of the Concan).
„ dioica, *Roxb*	कडूपडवळ Karúparval (of Guzerat).
„ palmata, *Roxb*.....	कौंडल or कवंडळ Kaundal or Kavandal.
Trigonella corniculata, *Linn*...	तीरप Tirap.
„ Fenum-g r œ c u m, *Linn.*	मेथी Methi.
Triticum æstivum, *Lam*	गहूं Gahún.
Triumfetta pilosa, *Roth*..	कुतरें वांदरें Kútre Vándré.
„ rhomboidea, *Jacq*...	निचरडी Nichardi.
Turnera ulmifolia, *Don*	भिंजरा Bhinjrá.
Turræa virens, *Linn*	कापूर भेंडी Kápúr-bhendi.

Tylophora asthmatica, *W. & A.*	पित्तकारी Pítkári, पित्तमारी Pitmári, पित्तवेल Pítvel.
,, carnosa, *Wall*	डिकवेल Díkvel.
,, fasciculata, *Ham*...	भुईदोडी Bhui dori.
,, mollissima, *Wight*..	मोशकी Moshákí.
Typha angustifolia, *Linn*.....	रामबाण Rámbán, रानबाजरी Ránbájri.
Ulmus integrifolia, *Roxb*.....	वावळा Vávaḷá, पापडा Pápará, ऐनसादडा Ainsádara.
Uncaria Gambier, *Hunter* (extract).	चिनी कात Chini kát (*impd.*)
Uraria lagopoides, *D. C.*	डवला Davalá, पिठवण Pithvan.
Urena lobata, *Linn*.....	वनभेंडी Vanbhendi.
,, sinuata, *Linn*	रानकापशी Rán kápshi,
Urginea indica, *Kunth*.....	रानकांदा Rán kándá, कोचिंदा Kochinda, कोलकांदा Kolkándá.
Urostigma	*See* Ficus.
Urtica interrupta, *Linn*.....	खाजकुली Kháj kúl, वेडेकोलती rérékolti, आग्या Ágiyá.
Utricularia albo-cœrulea	काजटचीघास Kájat-chi-ghás.
Uvaria odoratissima	काळाचंपा Kálá chámpá, विलायतीचंपा Viláyeti chámpá.
Vachellia Farnesiana	*See* Acacia Farnesiana.
Valeriana Hardwickii, *Wall.* (root).	तगरगंठोडा Tagarganthoḍa (*impd.*)
Valeriana Hookeriana, *W. & A.*	काळागवर Kálágavar.
Vandellia pedunculata, *Benth.*	गडगवेल Gaḍagvel.
Vangueria edulis, *Vahl*.....	आळू Áḷú.
,, spinosa, *Roxb*.....	चिरचोळी Chircholi.
Vateria indica, *Linn* (resin)...	सफेद डामर Safed dámar, चंद्रुस Chandrús (*impd*).
Ventilago Madraspatana, *Gärtn.*	खांडवेल Kháṇḍvel लोखंडी Lokhaṇḍi.
Verbesina biflora	*See* Wedelia biflora.
Vernonia anthelmintica, *Willd.*	काळें जिरें Kálé jiré, कडु जिरें Karú jiré.
,, conyzoides, *Wight* ...	कारळचें Káralyé. सहादेवी Sahádevi.
,, divergens, *Benth*.....	बून्दर Búndar.
Viburnum fœtidum, *Wall*.....	नरवेल Narvel.
Vicia Faba, *Linn* (seed)	बाकला Bákalá (*impd.*)
,, hirsuta, *Koch*	अंकरी Ankri.
Vigna Catiang, *Endl*.....	चौळाई Choulai.
,, vexillata, *Benth*	बिरमबोल Birambol, हलुला Halúlá.
Vinca rosea, *Roxb*	सदाफूल Sadaphúl.
Viola odorata, *Linn.* (flowers)..	गुलेबनफशा Gúlébanafshá (*impd.*)
suffruticosa	*See* Ionidium suffruticosum.

Viscum album, *Linn.* (fruit)...	किशमिशे कावलीयान Kishmishé, Kávaliyán (*impd.*)
Vitex Negundo, *Linn.*, and trifolia, *Linn.*	निर्गूंडी Nirgúndi, निर्गुडी Nirgúri, इंद्राणी Indráni. लिंगुर Lingúr.
,, sp. (fruit)	संभालू Sambhálú, रेणुका Rénúká (*impd.*)
Vitis araneosus, *Dalz.*	बेंदरवेल Bendarvel, घोडवेल Ghorvel.
,, ,, (root)	चमारमुसली Chamarmúsli.
,, auriculata, *Roxb*.....	काळीवेल Kálivel.
,, carnosa, *Wall.*	ओडी Oḍi.
,, discolor, *Dalz.*	तांबडे पानांची चांदवेल Tambare pánáchi chandvel, तेलीचावेल Telichavel.
,, indica, *Linn*	पालकांदा Pálkándá.
,, lanceolaria, *Roxb.*	खाजगोलीचावेल Khájgolichavel.
,, latifolia, *Roxb.*	नादेणा Nádená.
,, quadrangularis, *Wall.* ...	हरसंकर Harsankar, म्हैसवेल Mhaisvel, खरबुटी Kharbúti, चौधारी कांडवेल Chaudárikanḍvel.
,, repanda, *W. & A.*.....	गेंडळ Genḍaḷ.
,, Rheedii, *W. & A.*	वांसा Vánsá.
,, tomentosa	शेंडवेल Shendvel.
,, vinifera, *Linn.*	द्राक्ष Dráksha.
Voandseia subterranea (seed)...	मोसंबी चणा Mosambi-chaná.
Volutarella divaricata, *Benth...*	बादावर्द Bádáward.
Webera cornbosa, *Willd*	कारें Káré.
Wedelia biflora, *D. C*.....	सूनकी Súnki.
,, calendulacea, *Less.* ...	पिवळामाका Pivaḷámáká.
Withania coagulans, *Dunal.* ...	काकनज् Káknaj, पनीरबंद Panirband.
,, somnifera, *Dunal.* ...	अश्वगंधा Ashvagandá, तिला Tilá, कंचुकी Kanchúki.
Woodfordia floribunda, *Salisb.*	धाउरी Dhauri, धायटी Dhayati ,धाऊसी Dhasisi फुलसटी Phúlsati, धायफळ Dhaiphal.
Wrightia tinctoria, *Br.*	काळाकुडा Kálákúrá.
,, ,, (seed)	गोड इंद्रजव Gora indrajav.
,, tomentosa, *Roem et Schult.*	तांबडाकुडा Támbará-kúra.
Xanthium strumarium, *Linn...*	शंकेश्वर Shankesvar.
Xanthochymus ovalifolius	*See* Garcinia ovalifolia.
,, pictorius	*See* Garcinia Xanthochymus.
Xylia dolabriformis, *Benth.* ...	येरुळ Yerúl, जांब Jamb.
Zanonia indica, *Linn*.....	चिरपुटी Chirpúti.
Zanthoxylum alatum, *Roxb.* ...	तेजफळ Tejphal, तेजबळ Tejbúl.



NEST OF THE CRESTED TREE SWIFT (DENDROCHELIDON CORONATA) NATURAL SIZE

Made of small pieces of bark cemented together with saliva to the dead Branch of a Tree.

Zanthoxylum Rhetsa, *D. C.*..	तिसळ Tisal, त्रिफळ Triphal, चिरफळ Chir-phal.
Zataria multiflora, *Boiss.*	सातर् Sátar (*impd.*)
Zea Mays, *Linn*.....	मकाई Makai, बुटा Bútá.
Zehneria umbellata, *Thwaites.*	गोमेत्ता or गोमेटा, Gomettá or gométá.
,, Baneriana.	वराळी Varáli.
Zinziber Cassumuner, *Roxb.* ...	नींसन Nisan, मलबारी हळद Malabári-halad.
,, officinale, *Roscoe*	आलें Alé, अद्रक Adrak.
,, ,, (dry).....	सुंठ Súnth.
,, macrostachyum, *Dalz.*.	नींसन Nisan.
Zizyphus Jujuba, *Lam.*	बोर Bor, भेर Bher, रायबोर Raibor.
,, rugosus, *Lam*	तोरण Toran.
,, vulgaris, *Lam*.....	उन्नाब् Unnáb (*impd.*)
,, xylopyrus, *Willd.* ...	गूती Gúti, घोंट Ghont, भुरगुती Bhúrgúti.
Zygophyllum simplex, *Linn* ...	पतलानी Patláni.
Zornia diphylla	नाळबरगी or बरकी Nalabargi or barki.

"NESTING OF THE INDIAN HIRUNDINES."

By Lieut. H. E. Barnes.

The Hirundines are popularly known as Swallows and Martins (*Hirundininæ*). To these I add the Swifts (*Cypsellinæ*), as they have many features in common, and together comprise one family (*Hirundinidæ*). They are well represented in India, there being no less than forty-five species supposed to occur within our limits, but of this number five are somewhat doubtful. When we consider that there are but four species frequenting the British Isles [excluding the Spine-tailed Swallow (*Acanthylis caudacuta*), the Purple Martin (*Hirundo purpurea*), and the Alpine Swift (*Cypsellus melba*), all of which are extremely rare visitors], we at once see how well favoured in this respect India is compared with Great Britain. Some of these are cold weather visitors only and do not remain to breed, and the nidification of many is but imperfectly known. The habitat of several is very restricted, while others again, although generally distributed throughout the country, are yet extremely local. For instance, the Palm Swift (*Cypsellus batassiensis*) is found wherever the tar or toddy palm (*Borassus flabelliformis*) abounds, but nowhere else. In the Hirundines the bill is very small, but the gape is unusually large, reaching to a point below the eye. They all feed exclusively on insects, usually small ones, such as mosquitoes, midges and gnats. These they invariably capture on the wing.

When they have young in the nest, they collect these insects into a mass or ball which is retained in the mouth. The number thus collected is almost incredible. Their long narrow wings are admirably suited to an aërial life, and they are capable of sustaining themselves on the wing throughout the whole day, without showing the least sign of fatigue. At times they fly so high as to be barely visible, while at others they only just skim the surface of a tank. The toes of the swifts are all directed forward, enabling them to cling to the slightest projection with perfect ease, but the swallows do not possess this faculty. Some of them are exceedingly beautiful, but others are much less ornate, their colours ranging from the bright steel-blue of the Wire-tailed Swallow (*Hirundo filifera*), (which is, to my thinking, the handsomest of the family), through the sober brown of the little Sand Martin (*Cotyle sinensis*), to the sombre-hue of the better known Swift (*Cypsellus affinis*). Their nests exhibit great diversity, both as regards the style of architecture and the materials used in their construction, but each individual of a species builds a similar nest and makes use of the same kind of material, so that an oologist of moderate experience on finding a nest can tell at a glance to what species the little architect belongs. The sites chosen for the nests differ still more than the nests themselves. Some species attach them to the faces of perpendicular cliffs; others to the eaves of houses. Some place them under bridges or culverts. One chooses the leaf of a toddy palm; another a decayed bough of an acacia tree; while another bores a hole in the sandy bank of a river. Many breed in colonies, but the greater number singly. Some court the presence of man, others quite the reverse. They are mostly birds of small size. One of the largest we have in India is the Alpine Swift, which measures about nine inches in length. The Common Chimney (*Hirundo rustica*) and Wire-tailed Swallows, the Dusky Crag (*Ptyonoprogne concolor*), and several other Martins make half saucer or cup-shape nests. The first-named does not breed in the plains of India, but on the approach of the hot weather retires further north for that purpose. I found them breeding freely in the Bolan Pass and also in Southern Afghanistan, but the Wire-tailed Swallow and the Dusky Crag Martin breed generally all over the country, rearing at least two broods in the year, one in the spring and the other in the autumn. If the first clutch of eggs be taken they will lay a second, and if that be taken, a third in the same nest. The nest of the Common Swallow is gene-

rally affixed to the rafters of an outhouse or other building. They do not seem to mind the presence of man in the least. The nest of the Wire-tailed Swallow is generally placed under the cornice of a bridge, or under the bridge itself, sometimes under an overhanging shelf of rock, but always in close vicinity to water. That of the Crag Martin is placed under a projection in the face of a rocky cliff, far from the haunts of man, or under the eaves of a house in his very midst. The nests of all three are well lined with soft feathers, and they often serve for a second brood, the feathers only being renewed. The eggs, three in number, are very handsome, being white with a delicate pink tint when fresh and unblown, thickly spotted and speckled with bright red-brown and inky-purple, but the markings on the eggs of the latter are not so bright or so well defined as on those of the two former. The nest of the Mosque Swallow (*Hirundo erythropygia*) is built after a very different pattern, but the material used is the same, *viz.*, mud, which the bird procures from the banks of the nearest pond or river. Both sexes assist in making the nest, which is of a peculiar shape, and has been, not inaptly, described as retort-shape, or rather half-retort. It is usually affixed to the roof of a cave, bridge, or culvert, or to the under-surface of the ledge of a rock. They construct a large bulb-like chamber, five or six inches in diameter, with a tubular passage of varying length reaching occasionally to quite nine inches, but in general the length is not more than four or five. The male bird often goes on lengthening this passage after the eggs are laid and while the female is sitting on them. The nest is well lined with soft feathers, and the eggs, three in number, are pure unspotted white. After the birds have once chosen a site for a nest, they are very hard to drive away. I have often broken open nests to see if any eggs had been laid, and they have always been repaired, and I have eventually obtained eggs from them. To such an extent is the constructive faculty developed in these birds that they often build two or more nests before they are satisfied, and they are known to make a winter residence for themselves in which eggs are never found. They are solitary breeders. Not so, however, the Cliff Swallows (*Hirundo fluvicola*), whose immense clusters of nests often amount to from one hundred and fifty to two hundred in number. They also build retort-shape nests, but in quite a different fashion, the bulbs or chamber portions being affixed to the under-surface of a shelving rock, or under a bridge with the tubes hanging down or rather a

little outwards, the whole looking not unlike a huge honeycomb. They are well lined with feathers, and the eggs, three in number, vary a great deal in shape, size, and colour. About half of them are pure unspotted white, and the remaining half are more or less spotted, speckled, or streaked with yellowish-brown. These markings are, however, not very clearly defined. All the eggs of a clutch are of the same type. They breed at least twice a year, nests being found from July to April in most places where they breed. These colonies are always near water. Their nests are occasionally appropriated by the Common Swift. A cluster of these nests that I found under a bridge on the Saugor road, about twenty miles from Kareli, was jointly tenanted by Cliff Swallows, Indian Swifts, and Common Sparrows (*Passer indicus*). The outer nests were occupied by the Swifts and Sparrows and the inner ones by the Cliff Swallows. The next birds are the Sand Martins (*Cotyle riparia*, *C. subsoccata, C. sinensis*), of which it is still an open question whether one, two, or three species occur in India. I myself have only met with one, and this is the Indian Sand Martin, whose method of breeding is somewhat similar to that of our British species, but the nesting holes seem much more scattered. They bore holes in the sandy banks of rivers to the depth of one and a half to more than four feet according to the relative hardness of the soil and at the end of this hole or passage, which is somewhat enlarged, they make a nest, composed of fine grass roots and feathers. The eggs are pure, spotless white, and almost devoid of gloss. I have never found more than three eggs in any one nest, but others speak of finding as many as five. This completes the Swallows and Martins. The Swifts differ widely in many respects from the foregoing, as do also their nests. Mud that entered so largely into their construction is now no longer found, but in its stead agglutinated saliva is most frequently used. The different species of swifts build very dissimilar nests. The nesting of the Indian Swift is so well known that it is almost superfluous to say anything about it, but frequently common every-day objects are passed over unnoticed, and to meet such cases as these I will briefly describe their nests. As a rule, they breed together in great numbers. They often make a huge cluster of nests, which they affix to the roof of a cave or other suitable place, with isolated nests or small clumps of two or three, scattered here and there in close proximity to the central mass. The bird frequents the busiest thoroughfares, as well as the most

retired spots. Another favourite site for their nests is the space between the rafters of a stable roof or verandah as well as under the eaves of houses. Great numbers of them may now be seen breeding in the verandah, under the Commisssry-General's offices in the Fort. Their nests, which take a considerable time to construct, are com. posed of agglutinated saliva mixed with a few feathers and straws. They are of no particular shape, being at times long and narrow, occasionally almost round, but most often they are of a very irregular oblong shape. The eggs, three in number, are long narrow ovals, of a pure glossless white. The birds seem to be always breeding, for I see from my notes that there is not a month in the year in which I have not taken eggs or found nestlings more or less callow. I have never seen any Indian eggs of the Alpine Swift, but Mr. Davidson, of Malligaum, showed me both nests and nestlings which he had obtained from the mountains in that district. He says that the birds breed in deep clefts and fissures of almost inaccessible rocks. On several occasions he made attempts to secure their eggs. These places are always inaccessible from below. and generally it is impossible to get on the cliffs above them, so as to be able to let down a rope. In one or two places, however, they breed on cliffs, above which people can walk with safety, and the Bheels get down to them in the same way as they do to take honey. A rope ladder is constructed of pieces of bamboo about fifteen inches long, tied between two strong ropes, which are fastened to a very thick rope. The steps are two and a half feet apart, so that a long ladder does not weigh very much. The thick rope is tied to a tree if possible, if not it is held by a number of men and the rope ladder hung over the precipice. A Bheel then ties a light rope under his arms, and with the end held by people above who pay out the rope, runs down the ladder which swings about in the wind. In taking the nest of the Alpine Swift, however, the difficulty lies in the fact that they breed in fissures stretching upwards into overhanging cliffs. Many of these places the man cannot get at, or even if he can the nests are out of his reach. During the rains the people refused to try at all, on the ground that at that season the overhanging cliff would probably fall on them. The specimen of nest shows where it was fastened to both sides of the fissure. It is a very solid structure in comparison to that of the Common Indian Swift. The Palm Swift is, as I have already said, found throughout the plains of India, wherever the toddy tree

abounds, and it is to the under-surface of a leaf of this tree that they attach their tiny nests. They are composed of fine vegetable down, cemented together by the saliva of the birds. The upper edge of the rim of the nest (which in shape resembles a watch pocket) is generally very hard and cordlike, but the remaining portion of it is much softer. The eggs, three in number, are perfect miniatures of those of the Common Swift. They are solitary builders, as a rule, generally not more than one or two nests being found on the same tree. The Palm Roof Swifts (*Cypsellus infumatus*) are stated by Dr. Jerdon (I have myself never seen one), to attach their nests to the palm leaves, used by the people in the Naga Hills to roof their huts. The roofs consist of two separate layers, and it is to the upper surface of the lower layer that the nests are attached. One of the Edible Nest Swiftlets (*Collocalia unicolor*) breeds in several places on the Nilgiri Hills, as also on the Vingorla Rocks, from whence it is stated that one hundredweight of nests are exported every season. These nests are, however, much inferior in value to those of *C. linchi* and *C. spodiapygia*, which are clear white. Both kinds are, however, esteemed a delicacy in China and fetch there a good price. I will conclude my remarks with an account of the nesting of, perhaps, the most interesting bird of all. I allude to the Crested Tree Swift (*Dendrochelidon coronata*), which makes its nest against the side of a dead branch, in shape like a very shallow half saucer, which can easily be covered by a depreciated rupee, and it is nowhere more than one-eighth of an inch in thickness, and is barely half an inch in depth. As might be expected, a single egg only is laid, which is of a pure glossless white. The nest itself is composed of thin flakes of bark glued together with saliva.

My object has been to give a plain description, or rather account, of the nesting habits of these, to me, interesting birds, and I have avoided the use of scientific and technical terms as much as possible.

CATALOGUE

OF THE SNAKES IN THE SOCIETY'S COLLECTION.

Families.		Genera and Species.	Locality.
I.—Typhlopidæ .. (Blind Snakes.)	1	Typhlops porrectus	Bandora, Bombay.
,, ...	1	,, ,, ...	Cutch.
,, ...	1	,, brahminus	Mauritius.
,, ...	1	,, ,, ...	Poona.
,, ...	1	Onychocephalus acutus...	Neemuch.
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, ,, ...	Alibag, Kolaba.
II.—Tortricidæ .. (The Short-tailed Earth Snakes)	1	Cylindrophis maculatus...	Ceylon.
	1	,, rufus	Henzada, Burmah.
III.—Pythonidæ . (The Pythons)	1	Python molurus	Lanowli.
	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, reticulatus	Mergui Archipelago.
,, ...	1	,, ,, (juv.)...	Moulmein.
IV.—Erycidæ..... (The Sand Snakes)	1	Gongylophis conicus	Bombay.
	...	,, ,, ...	,,
,, ...	...	,, ,, ...	Sangor, C. P.
,, ...	...	,, ,, ...	Hingoli, Deccan.
,, ...	...	,, ,, ...	Poona.
,, ...	1	Eryx Johnii	Bombay.
,, ...	1	,, ,, (juv.).....	,,
,, ...	...	,, ,, (juv.).....	Poona.
V.—Acrochordidæ (The Wart Snakes.)	1	Chersydrus granulatus ...	Bombay Harbour.
	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
VII.—Uropeltidæ. (Rough-tailed Earth Snakes.)	1	Sillybura Elliotii	Belgaum.
	1	,, bicatenata.....	Poona.
,, ...	2	,, macrolepis	Khandalla.
,, ...	2	,, ,, ...	
,, ...	1	,, Shortii	Lanowli.
VII.—Xenopeltidæ. (Iridescent Earth Snakes)	1	Xenopeltis unicolor.....	Henzada, Burmah.
VIII.—Calamaridæ. (Dwarf Snakes.)	1	Aspidura trachyprocta ...	Ceylon.
	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, (juv.)..	,,
IX.—Homalopsidæ. (River Snakes.)	1	Feronia sieboldi	Saugor, C. P.
	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,

Families.		Genera and Species.	Locality.
IX.—Homalopsidæ—(*contd.*)	1	Cerberus rhynchops	Bombay Harbour.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, (juv.)...	,,
,, ...	1	,, ,, (juv)...	,,
,, ...	3	,, ,, (juv.)...	Carwar.
,, ...	1	Ferdonia unicolor	Moulmein.
,, ...	1	,, ,, ...	,,
,, ...	1	Hipistis hydrinus	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
X.—Amblycephalidæ. (Blunt-headed Snakes.)		None.	
XI.—Oligontidæ (Filleted Ground Snakes.)	1	Oligodon subgriseus	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Deolali.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Colaba.
,, ...	1	,, ,, ...	Khandalla.
,, ...	1	,, ,, ...	Ceylon.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, ,, ...	,,
,, ...	1	Oligodon sublineatus	Ceylon.
,, ...	1	,, spilonotus	Bombay.
,, ...	1	,, subpunctatus ..	Lanowli.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, (juv.)...	Poona.
,, ...	1	,, fasciatus (juv.)..	Bombay.
,, ...	...	,, ,, (juv.)..	Poona.
,, ...	1	Simotes Russellii	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, ,, (juv)...	,,
,, ...	1	,, læniatus	Burmah.
,, ...	1	,, ,, ...	,,
XII.—Lycodontidæ.	1	Lycodon aulicus	Thanna.
(Harmless-fanged Snakes)	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, (Ceylon variety)..	Ceylon.
,, ...	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Ceylon.
,, ...	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Poona.
XIII.—Colubridæ	1	Cyclophis calamaria	Ceylon.
Group I-Coronellina.	1	,, ,, ...	Mahableshwar.

Families.		Genera and Species.	Locality.
(Ground Colubers)	1	Cyclophia calamaria	Mahableshwar.
XIII.—Colubridæ.	1	Ptyas mucosus (head) ...	Bombay
Group II.-Colubrina.	1	,, ,, ,, ...	,,
(Agile Colubers.)	1	,, ,, (juv)	,,
,, ...	1	,, ,, (juv.)	,,
,, ...	1	,, ,, (juv.)	,,
,, ...	1	,, ,, fœtus in egg	,,
,, ...	1	,, ,, ,, ...	,,
,, ...	1	Zamenis diadema	Campbellpore.
,, ...	1	,, ,, ...	Bhooj, Cutch.
,, ...	1	,, fasciolatus	Thanna.
,, ...	1	,, ,, ...	Khandalla.
,, ...	1	,, ,, ...	Saugor, C. P.
,, ...	1	,, ,, ...	Poona.
,, ...	1	,, ventrimaculatus.	Perim Island.
,, ...	1	,, ,, ...	Campbellpore.
,, ...	1	Cynophis Helena.....	Ceylon.
,, ...	1	,, Malabaricus ...	Mahableshwar.
,, ...	8	,, ,, ...	Khandalla.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, (juv.)...	Lanowli.
,, ...	1	,, ,, ...	Khandala.
XIII.—Colubridæ. Group III.-Dryadina. (Bush Colubers)		None.	
XIII.—Colubridæ.	1	Tropidonotus quincunctiatus.	Bombay.
Group IV.—Nalricina.	1	,, ,, ...	,,
(Amphib. Colubers.)	1	,, variety ...	Ceylon.
,, ...	1	,, ,, ...	Mahableshwar.
,, ...	1	,, (fœtal specimen in egg)	Bombay.
,, ...	1	,, (juv.).....	Poona.
,, ...	1	,, stolatus	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, (fœtal specimen in egg.)	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Poona.
,, ...	1	,, platyceps	Thundiani.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, plumbicolor ...	Saugor.
,, ...	1	,, ,, ...	Kirkee.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, ,, ...	Deolali.
,, ...	1	,, ,, ...	Poona.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, Beddomii	Mahableshwar.
,, ...	1	,, ,, ...	,,
,, ...	1	,, punctatus.....	Alibag.
,, ...	1	,, ,, ...	,,

Families.		Genera and Species.	Locality.
XIV.—Dendrophidæ. (Tree Snakes.)	1	Chrysopelea ornata	Ceylon.
	1	,, ,, ...	Carwar.
,, ...	1	,, ,, (juv.) ...	,,
,, ...	1	Dendrophis picta.....	Surat.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	S. Travancore
XV.—Dryiophidæ (Long-nosed Tree Snakes.)	1	Passerita mycterizans ...	Thanna.
	1	,, ...	Bombay.
	1	,, ...	,,
,, ...	1	,, ...	Ceylon.
,, ...	1	,, ...	Poona.
,, ...	1	,, ...	Carwar.
XVI.—Dipsadidæ. (Brown-headed Tree Snakes.)	1	Dipsas gokool	Saugor.
	1	,, ,, ...	Rutnágiri.
	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Poona.
,, ...	1	Dipsas Ceylonensis	Alibag, Kolaba.
,, ...	1	Dipsas triganata	Poona.
XVII.—Psammophidæ. (Desert Snakes.)	1	Psammophis Leithii	Campbellpore.
XVIII.—Elapidæ. (Venomous Colubrine Land Snakes.)	1	Naga tripudians	Bombay.
	1	,, ,, ...	,,
	1	,, ,, (fœtus in egg)	,,
	1	,, ,, (juv.).....	,,
,, ...	1	,, ,, (juv.)...	,,
,, ...	1	,, ,, (Kemuliah).	Henzada, Burmah.
,, ...	2	,, ,, (juv.).....	Poona.
,, ...	...	Bungarus fasciatus	Henzada, Burmah.
,, ...	...	,, ,, ...	,,
,, ...	1	,, arcuatus	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Saugor, C. P.
,, ...	1	,, ,, ...	Ahmedabad.
,, ...	1	Ophiophagus elaps (head)	Carwar.
,, ...	1	,, ,, (skin).	Canara, (15-5).
,, ...	1	,, ,, ...	Penang.
,, ...	1	Callophis nigrescens	Mahableshwar.
,, ...	1	,, ,, ...	Carwar.
,, ...	1	,, trimaculatus ...	Colaba, Bombay.
,, ...	1	,, ,, ...	Bandora ,,
XIX.—Hydrophidæ.	1	Hydrophis curta	Persian Gulf.
(Sea Snakes).....	1	,, ,, ...	Bombay Harbour.
,, ...	1	,, ,, ...	Porebunder.
,, ...	1	,, robusta	Alibag
,, ...	1	,, diadema	Bombay Seas.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, aurifasciatus ...	Persian Gulf.
,, ...	1	,, bicolor	Bombay Seas.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,

Families.		Genera and Species.	Locality.
XIX.—Hydrophidæ—*contd.*	1	Hydrophis bicolor	Bombay Seas.
,, ...	1	,, Phipsoni.....	,,
,, ...	1	,, Guntherii	Kattywar Coast.
,, ...	1	,, cloris	Bombay Seas.
,, ...	1	,, ,, ...	,,
,, ...	1	,, Lindsayi	,,
,, ...	1	Enhydrina bengalensis ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ..	,,
,, ...	1	,, ,, ...	,,
XX.—Crotalidæ. (Crotali or Pit Vipers.)	1	Trimeresurus trigonocephalus.	Ceylon.
	1	,, ,,	,,
,, ...	1	,, ,,	,,
,, ...	1	,, anamallensis	Khandalla.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, (head)	,,
,, ...	1	,, carinatus	Monlmein.
,, ...	1	,, strigatus	Carwar.
,, ...	1	Hypnale nepa	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Ceylon.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Carwar.
,, ...	1	Halys himalayanus	Thundiani, Punjab.
,, ...	1	,, ,, ...	,,
XXI.—Viperidæ. (Vipers.)	1	Daboia elegans	Saugor, C. P.
	1	,, ,, (head) ...	Hurda, C. P.
,, ...	1	,, ,, ...	Bombay.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Ceylon.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Bombay.
,, ...	1	Echis carinata	Sind.
,, ...	1	,, ,, ...	Bhooj, Cutch.
,, ...	1	,, ,, ...	Mahableshwar.
,, ...	1	,, ,, ...	Ratnágiri.
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	,,
,, ...	1	,, ,, ...	Aden.
,, ...	1	,, ,, ...	Ceylon.
,, ...	1	,, ,, ...	Kirkee.
,, ...	1	,, ,, ...	Hingoli.
,, ...	1	,, ,, ...	Poona.

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THE "FOLKLORE OF INDIAN PLANTS."

THE following is a report of the lecture on the above subject given by Dr. Kirtikar at the Sassoon Mechanics' Institute on Monday, the 9th January 1888:—

From time immemorial plant life has always had its tales connected with itself or with the places in which it grows. In ancient Grecian and Roman literature we find that there are certain plants favourite to certain gods and goddesses. Bacchus is described as ivy-clad. Æsculapius, the god of the physicians and physic, wears a crown of laurel, because the tree is supposed to be a powerful cure for disease of all kinds. The goddess Concordia (concord) has her symbol illustrated by two right hands joined together and a pomegranate. Pax, the goddess of peace, is represented as being crowned with olives and laurel, bearing ears of corn in her hands. Pluto, the king of the nether regions, is represented as being sometimes crowned with Narcissus flowers (white daffodils), and sometimes with cypress leaves. The god Hymenæus, presiding over marriages, and companion of Venus, is crowned with sweet marjoram, and sometimes roses. Who can read without horror the experience of Æneas as has been graphically pourtrayed by the masterly pen of Virgil, when Æneas on landing on the Thracian shore plucks a shoot of what is apparently a shaggy myrtle bush! Drops of dark blood arise from where the shoot was torn off the ground. He did it again, and again did blood ooze out of the upturned soil. At last a voice arose from the bosom of the soil "Spare me! I am Polydorus, buried here. Let me enjoy repose in my grave, murdered as I lie by the hand of a Thracian monarch, who killed me for my gold." Take another instance from classic legends, when Phaeton, one of the children of the Sun, mounted his father's chariot, and being unable to manage the fiery horses, set fire to heaven and earth, Jupiter struck him out of the chariot with thunder, and cast him headlong into the river Po. Phaeton's sisters mourned over the loss of their brother, and wept uncontrolled by the side of the river. The gods in their compassion changed the sisters into *poplar trees*. Proserpine, the queen of the infernal regions, loved her husband Pluto—the *black* god so much, *lovely as she was*, that she in a fit of jealousy converted his mistress *Mentha* into *mint*, a plant known after her name. We know again the story of the youth Narcissus who was so infatuated with his own beauty that he fell in deep love with himself. In the love of his

own matchless beauty he pined away, when at last the compassion of gods turned him into a daffodil In our own day we speak of "successful" men bearing the palm, from the ancient Roman custom of giving the gladiator a palm tree branch. Our leading poet is called the "Poet Laureate." The laurel is an emblem of peace and victory in our day. In modern days our flowers have a language, which finds no small pleasure, encouragement, and fruitful occupation to two young loving hearts about to be united in the sacred bonds of wedlock The lady love sends a beautifully pressed dried heart's-ease. The sweetheart swears constancy and warmth by enclosing a rose. The lady-love sends a lily-of-the-valley—the sweetheart sends back love-lies-bleeding, and so on till the orange blossom veil hands over the virgin wife to her ardently admiring husband. Nor is the village tree, or the way-side bush, free from its own tale. Near Glastonbury Abbey they say there is an old hawthorn tree that sprang up and at once threw out bud and blossom, when Joseph, the first preacher of Christianity in Britain, thrust his staff into the ground to convince the British Islanders that he had a divine mission to fulfil. They all sing its praises. India is no exception to this universal natural propensity of the human mind to connect tales of more or less interest with the trees and plants we see around.

Have you seen the peepul (*Ficus religiosa*) tree yonder? It is dusk now. Don't you pass by it. Don't stand under its rustling branches, or you will be possessed of the spirits that haunt its deepening shadow. Why should the peepul more than any other tree, say its neighbour the acacia or babul, be haunted by spirits? There is no more reason for this than there is for young Narcissus being looked upon as turned into a daffodil in preference to a rose. Nobody has seen these spirits in *propriâ personâ*. It is all imagination. Good spirits, according to other accounts, dwell on the different parts of the peepul. Thus Bramhâ, the creator of men, is at the place where the roots strike the ground; Vishnu, the preserver, is at its middle; and Shiva, the destroyer, is at the top. The ghosts, or evil spirits, are supposed to haunt the branches. It is possible that the idea of evil spirits has struck the story-teller's mind from the topmost deity being inordinately fond of the company of goblins or demons. What are these demons? Principally there are two—the *Hedli*, a female, and the *Munjâ*, or an unmarried youth, a boy under or about twelve. The *Hedli* is a ghastly figure, being the spirit of a married woman dying during the lifetime of her husband. She is

dressed in a yellow *sâri*. Her hair is dishevelled, her forehead besmeared with red powder, and her eyelashes darkened with lamp-black. She has the appearance of wildness, and her general demeanour betokens mischief, for death has been early, and the woman has died before properly enjoying the world. The youthful *Munjâ* is not so wild, having died before he was old enough to appreciate a worldly life. The spirit *Munjâ* is at the best an indifferent spirit. He is dressed in the fashion suited to his age and calling. His age is boyish. He has just passed through the ceremony of the investiture of the holy thread, but has died before the sacred girdle is off his waist. He is nude, he carries with him a staff obtained from the palas tree (*Butea frondosa*). He has the recently assumed sacred thread across his left shoulder. He has his water bowl and his *jholi*, or bag, to receive the alms he asks to sustain his body during the period of his pupilage. Why such a tender and harmless spirit should ever have been created by the story-teller beats my imagination. I can understand an angry, unsatisfied grown-up person, male or female, being anxious to linger around the place dear to him or her during life, and being angry and dissatisfied, they might wear countenances horrid enough to terrify those whom they haunt; but I cannot understand this of a boy, whose spirit, after his boyish frolics, requires rest and peace, or whose lissome countenance wants a more congenial home than the constantly rustling branches of a shady peepul. There is no botanical reason why the peepul should be haunted by evil spirits. In Bombay it grows rather irregularly, but up-country I have seen its stem as perfect and erect, beautifully shining as it could be. The leaves lovely, delicately tinted, perfect in their frame work, and altogether when the stem is not irregular it is a lovely tree, though not productive of any edible fruit. The presence of the Hindoo trinity gods, therefore, is more suited to the general appearance of the peepul.

Far different in appearance is the *Umbar* tree, botanically called the *Ficus glomerata*, at the foot of which the guardian deity is *Dattâtraya*. The legend of the birth of this peaceful, all-powerful, and all-protecting deity is highly amusing. You already know the gods of the Hindoo trinity. Let me introduce to you their wives: Sâvitri, wife of Bramhâ; Lâkshmi, wife of Vishnu; and Pârvati, wife of Shiva. These three dutiful wives are extremely devoted to their respective lords. The story is that there was a certain saint called Atri, living happily with his devoted wife Anusayâ. Though the

wives of the gods forming the trinity were highly devoted to their respective husbands, it must be stated that Anusayâ far surpassed any known woman of her time in her devotion. Her entire submission to the will of her lord was well known. If ever, therefore, there was an object of universal envy in this respect, it was the wife of the humble saint Atri. He was powerful in his sanctity, and peaceful at home, not possessing much and yet wanting little. Rich in the love of his wife, he was the happiest among the living. Any god or goddess not quite at peace with his or her partner might have usefully learnt a lesson from their singularly pure and perfect lives. The gods of the Hindoo mythology, like all other mythic gods, were not perfect gods. They had their own domestic vexations. With a view, therefore, to have some "fun" the heavenly peripatetic chatterer *Nârad* appears on the scene. Who is *Nârad*? As I say, he is a peripatetic chatterer,—a messenger travelling between the heavenly and mundane spheres, a walking newspaper, a living encyclopædia, and a mellifluous singer like Orpheus of the Greeks. He is an energetic bachelor, carrying the *Vinâ* (or a kind of modified guitar) in one hand, and the *chiplya* in another (two chips of wood with brass jingles held between the middle finger and thumb and struck against each other, keeping time as the *Vinâ* is being played upon); singing and dancing, full of liveliness and full of glee. He is a man the very quintessence of wit and humour and of vast resources, ready to create misunderstandings between friends and companions, and foment quarrels between foes, and as equally ready with means, repairing wrongs resulting therefrom,—in plain words, a consummate peace-breaker and mischief-maker, the very imp of meddlesomeness, the minion of mockery, and with all this, a *saint* born and brought up—and what is more strange, an *ever-welcome* visitor of the immortal gods and mortal men, at whatever hour of night or day he paid his visit! He had the power of mysteriously disappearing from the lower to the higher world, and had no vehicle to carry him from place to place. He vanished in the airy regions, but when he was not disposed to be *incognito* the sweet strains of his ever charming music announced his arrival. True to his calling he paid a visit to each of the wives of the three gods I have mentioned—Brahmâ, Vishnu, and Shiva. He said to them that there was a woman in an humbler sphere of life who beat them all in her devotion to her lord and in her hospitality. It was not meet, said he, that it should be so. It was a disgrace to them that they of heaven were surpassed. What

could this chaff and banter of Nârad's do but rouse the green-eyed monster? The virulence of the jealousy of his fair listeners was boundless. They determined to try Anusayâ and to test her sense of hospitality, and so they packed off their husbands to the dwelling-house of this holy and humble pair. Leagues away they went, Brahmâ from his Satyaloka, Vishnu from Vaikunth, and Shiva from Kailâs, influenced by the entreaties of their wives. They stood as beggars at the door of Atri, asking alms, but imposing an absurd condition that the alms should be given by the lady of the house, Anusayâ, in a state of perfect nudity. This is palpably a prohibitive condition imposed with the sole object of putting to the severest test the hospitality of the host, under the strong presumption that it will not be fulfilled, the rules of hospitality will thereby be broken and the object of the trinity eventually gained. The story reminds one of Lady Godiva, the noble wife of the "grim Earl" of Coventry, who was called upon to ride uncovered through the town, if she wanted her hard-hearted husband to repeal an oppressive law, and thus save her subjects from heavy taxation. To return to our legend, then. The Hindoo trinity thus stood at the Rishi's door united in an act of self-immolation—for indeed self-immolation it was—as they were demanding more than was their due as beggars or as guests, and though they were supreme gods *incognito*, their act was one which no mind, human or divine, could ever look upon with approbation or with complacency, under any circumstance—far less would such a request be considered becoming on the part of guests and beggars. But beggars have sometimes strange ways of demanding alms. A woman's true dowry is modesty. To venture to attack that under the garb of hospitality, to make one's own demand as a guest, forgetting the commonest and plainest rules of hospitality, is too much to bear for even a saint. Yet the husband of Anusayâ was up to the occasion. Embarrassed, yet serene and unmoved, "sweet as the primrose peeps beneath the thorn," Anusayâ, the faithful wife and woman, says to the three guests "your will be done!" To send them away unsatisfied would be a life-long reproach. It would entail the loss of merit of former hospitalities. It would mean a life of moral extinction. Her husband in the meanwhile placed a potful of charmed water before his devoted wife, dignified in what to others would have been perturbation, but determined as a true woman always is, to do her duty to the last. The lady sprinkled a little of this charmed water prepared by her

husband on each of the pseudo-beggars, and if I may venture to express an opinion, it "served them right." For, behold! on the sprinkling of the water they three lost their manly forms and became tender *babies*. They were there in spirit, but their persons were no longer those that could take impression from the surrounding world. The lady Anusayâ thereafter at once fulfilled the condition of nudity, flung her garments aside, and with a dignity characteristic of a hostess she put the three babies to her breast, one after another, and fed them in their state of perfect innocence, thus fulfilling their demands without going beyond the bounds of modesty. She sang lullabies and sent the babies to sleep. Time passes. The husbands don't return home. What's become of them? *The Messenger of Heaven, Nârad,* is again on the scene. He knows it all. He is at the bottom of it. He informs the three wives, anxious about the return of their gallant husbands, that their husbands had been metamorphosed into babies, and were now in the arms of Anusaya, whom they had sent a trial. The laurel is the meed of mighty conquerors. The cradle is now the meed of these preposterous gods. You can imagine the consternation of the wives. Implorings and apologies of a touching kind prevailed after this. The time for claiming superiority was gone. The contest was at an end. There was a fall, and the humble pair was victorious. The *Rishi* was willing to forgive and forget. The charmed waters were sprinkled over the babies, and they became men again. To mark the circumstance, however, and also to serve a lesson to future generations, this united action of the three gods was symbolized in making a new deity by the union of three persons into one. This was the birth of god *Dâttatraya,* who is to be found at the foot of the *Umbar* or *Audumbar tree* (*Ficus glomerata*). He has only one body and six hands, but has three different heads, each representing a god of the Hindoo trinity. He was conceived in holiness and in the discharge of the solemn duty of hospitality, and is therefore a noble deity, the prince of peace, and guardian of good deeds.

Let me now take up the legend connected with another favourite and frequently seen tree, the banyan tree, the *Ficus indica.* On the full moon day of Jeshtha this tree is worshipped by all married ladies that they may escape the miseries of a widowed life. The story is that it was the worship of this tree that gave back to Savitri her husband Satyawân, who was stung to death by a cobra during his wanderings in the forest. The legend of Savatri has attracted the attention of

Count Gubernatis, that distinguished Oriental scholar who was among us some time ago. He has dramatized the story in Italian, which our learned antiquarian scholar, Dr. Gerson DaCunha, has rendered into English. There the story is given graphically though different from mine. Sufficè it to say here, that Nârad figures in this story also. Here it was through his instrumentality that Sâvitri knew the mode of recovering her husband from the Yama Rajah, King of the Infernal Regions (the Indian Pluto). After having worshipped the plant in the usual manner prescribed by the ritual, standing by the side of her husband's body that had just breathed its last, she invoked the lord of the nether world that her husband's life might be restored. The force of the worship of the banyan tree was so great that the King of Hell was obliged to give up the spirit of the deceased husband. It was no unmerited reward to a dutiful wife who had abandoned her parents and all her dear belongings, her country, and her comforts, to wander in the jungles with her husband—a companion in life to him as well as his deliverer, or regenerator after death. What woman with her beliefs trained in this direction, will not similarly worship a banyan tree if it is only to escape the sorrows and miseries of a widowed life? And yet how many an Indian woman is there at this day who has most devoutly worshipped the banyan every year with renewed faith, and yet in the end not escaped the crushing calamities of perpetual and relentless widowhood! If it had been in the power of plants and bushes to avert human sorrow and lessen the burden of human misery, the world would have been different! There would have been no misery at all.

There are two or three plants which are connected with the life history of the amorous god Krishna. They are the Tulsi (*Ocymum sanctum*), Kadamba (*Nauclea Cadamba*), and Pârijtak (*Nycanthes Arbor-Tristis*). The mythological character of Krishna is one of the most marvellously complex that has ever been created, or even attempted by any classical or modern writer. It is the leading character of the great epic of the Mahâbhârat. The mainsprings of his action are not simply dictated by a life of sensual pleasure, but if I may speak as a student of poetry, some parts of the life of Krishna afford an illustration of undying personal attachment to his devotees and astounding self-sacrifice in the interest of those who trusted in him.

The birth of the Tulsi plant has a story of its own. The plant wherever it grows or exists, assures us of the presence of Vishnu, and

Krishna being one of the incarnations of Vishnu (8th), his presence is identically constant in the plant. There is a day in the month of Kârtik, the 11th day in the first fortnight of the month when the Hindoos celebrate a wedding of the image of Krishna and the Tulsi plant. This plant is held in great veneration by the ladies particularly. It is worshipped every morning by those devout Hindoo ladies, who observe their ancient customs rigidly. After worshipping they go round the pot, in which the plant grows, a hundred times, or a thousand times, and in rare instances, on exceptional occasions, a hundred thousand times. Thus indirectly those who go through this apparently meaningless worship, get the opportunity of taking exercise of an early morning regularly, ending in a measure which is conducive to health. However that may be, whether the Tulsi plant is worshipped or not it exists, or at any rate ought to exist, in the backyard or front of a Hindoo's house, or among his collection of plants if he has any. The story told about the birth of this plant is this:—At the time of the churning of the great ocean, when fourteen jewels came out of the ocean, the goddess "Lakshmi," the gem "Kaustubh" and the plant "Pârijtak" fell to the lot Vishnu, who, as I have already said, formed one of the trinity. The god was so overjoyed, that tears came out of his eyes, trickled down his cheeks and fell on the ground. From every drop of these tears sprang a plant of Tulsi. There is yet another account of the origin of this plant given very graphically by a writer in one of the recent numbers of the *Indian Antiquary*. I may summarize the story briefly as I have heard it. The wife of a deity, named Jallandar, conceived a secret affection for Krishna. Silently loving him, she pined away—and eventually died without a reciprocation of her attachment from Krishna. After her death he realized the extent of her affection, and mourned sorely over the unrequited love of his admiring friend. But it was no use. Her body had been burnt. Her angelic form had disappeared "earth unto earth and dust unto dust." Ashes alone had remained. What could Krishna do but weep? It was too late for anything else. He threw himself down on the hot ashes of the broken-hearted woman, and wept bitterly in the deep agonies of disappointment. From every drop of his tear, it is said, arose a Tulsi plant. This story appears to better account for the annual marriage of the god with the Tulsi plant, whereby he is united in spirit with the symbol of her that had loved him fervently

but fruitlessly in life, and had, alas too late! gained in death the fruit of her secret affections.

The story of the *Kadamba* tree is a very amusing one. Krishna found the Gopis—his female friends—bathing in the river Jumna one day. He appeared unseen on the spot, and carried away their garments, which he left hanging on the Kadamba tree. What consternation this must have caused among the temporary losers of the garments had better be imagined than described. It is a terrible joke to practise on any body. But Krishna was full of all sorts of pranks and practical jokes.

The story of the *Pârijatak* plant is equally characteristic of the character of Krishna. I have already said that the Pârijtak plant was one of the fourteen gems obtained from the great churning of the ocean, and that Vishnu had become the happy possessor of this sweet-scented tree. Here, again, let me bring Nârad on the scene to help my story. He happened to have a flower from this tree which he had brought from the Paradise of Vishnu, and presented to Krishna. In his deep devotion to Rukmini, Krishna presented the flower to her in preference to any other wife of his. This shows the disadvantage of having more wives than one. The news seems to have reached the ears of Satyabhâmâ, another dear wife of his. Who do you think was the bearer of this tale to Satyabhámâ? Why? Nârad, of course. His restless soul would not remain quiet with simply presenting a rare sort of a flower to a deity he was visiting. One mischief must supersede another. How else are mischievous persons to find an occupation for themselves? What is the result of this report to Satyabhâmâ of the gift of a flower of Nyctanthes from Krishna to Rukmini? Satyabhâmá is electrified. Her lord Krishna, she feels, has slighted her. She is mightily offended. She is disconsolate. Nothing will please her; nothing will pacify her. How dared Krishna thus ill-use her? She can't explain. Has she been wanting in her duty, or has Krishna forgotten his former professions to her, or has Rukmini got the better of her lord? She must not remain silent now. Krishna must know from her how grievous her wrong has been. On his next visit to Satyabhámá, Krishna finds the door of her chamber locked up from within. No answer from her to his knocks. The unsuspecting husband knows of no cause, for he has given none for such treatment. He is unsuspecting because he does not know that the chief mischief-maker on this occasion is

the peripatetic Nârad. To return to the story. The door of the chamber was at last opened to the repeated entreaties of the knocker outside. On entry there was a scene, and on explanation of the cause of anger, followed by apologies, coupled with much persuasion on the part of Krishna, Satyabhâmâ was at once promised, not only a flower of the tree, but the whole tree itself. The tree (root stem, and branches all) was bodily transferred from Satyaloka by a messenger specially sent there to the garden of Satyabhâmâ. But the story would not be complete if I did not tell you the sequel of it. Satyabhâmâ, full of pride, gathered therefrom a few flowers and sent them in a golden case as a present to Rukmini, her rival in love, through her ladies-in-waiting. It so happened that Krishna having originally presented the flower to Rukmini, the Winds of the air had known the first bent of his mind, and had accordingly daily wafted abundance of *Pârijâtak* flowers from the garden of Satyabhâmâ into the garden of her rival Rukmini, so that when Satyabhâmâ's ladies-in-waiting arrived at Rukmini's house with the golden casket of a few stray flowers, they found their mistress's rival, much to their surprise, rolling in a bed of the flowers! Their discomfiture was great. This news was duly communicated by the ladies-in-waiting to Satyabhâmâ. Thus her haughty spirit had a fall. She had to acknowledge, in her heart much against her wish, that she had only the second place in the heart of Krishna.

There is supposed to be a time when once in the year during the Dewali holidays, on the 14th dark night of the month of Ashvin, the plants in the jungles speak and give information to herbalists wandering in the jungles. I have never wandered in the jungles at night, and certainly I would not do so on the principal night of Dewali, for, like Christmas, Dewali comes but once a year, but if ever I do, I am doubtful if I should understand the language of plants. There is, however, yet a sphere of usefulness for anybody that wanders the jungles in India by day; he may gather the herbs and simples, and he may assist in the work of renovating the Bombay flora. There is infinite variety in nature. "Age cannot wither her, nor custom stale her"; we may be able to examine old plants with new eyes, and we may be able to identify and classify the vast flora that yet lies insufficiently explored before us in this gorgeously green country and superbly rich soil.

ZOOLOGICAL NOTES.

Proceedings of the Zoological Society of London, Parts I., II. and III. of 1887.

As the proceedings of the Zoological Society of London are not easy to get at in this country for others than the Bombay members of the Society, the following notes of the contents of the first three parts issued in 1887, as far as they refer to this part of the world, may be of interest:—

Part I. notices the addition of the larger one-horned rhinoceros (*Rhinoceros unicornis*) to the Society's menagerie, presented by H. H. the Maharajah of Cooch Behar. There is an interesting article on the habits of the "Tree Trapdoor Spider of Graham's Town," which though not referring to the East, yet is of general interest; hence its mention here: also descriptions and plates of certain Coleoptera of Ceylon, collected in 1881-82: also a report on some Echinodermata from the Andamans, by Professor Bell, followed by an article with plates on a collection of Reptiles and Batrachians from the Loo-Choo Islands.

Part II. opens with a note on a Batrachian of the genus *Cacopus* (*C. globulosus*) sent by Mr. Thurston of the Madras Museum, who wrote: "On opening the visceral cavity, which was enormously distended, the distension was found to be caused by the presence of a mass of winged white ants, which when dried weighed 326 grains." The first article is an interesting one on the "Experimental Proof of the Protective Value of Colour and Markings in Insects in reference to their Vertebrate Enemies:" it spreads over 84 pages, full of particulars of many experiments. A letter from the Rev. G. Fisk, C. M. Z. S., of Capetown, was read at the meeting held on the 5th April, giving an account of how a mouse killed and ate a poisonous snake, or more correctly two; they were "young 'Ringhals,' probably from 7 to 14 days old."

In Part III. Mr. Sharpe contributes some remarks on a collection of Birds from Perak, followed by a description of some new Lepidoptera from Sikkim by H. J. Elwes, *viz.*, *Lethe tristigmata, Zophoesa mölleri, Chilades* (?) *pontis, Chilades sinensis Nipolycæna virgo, and Saturnia royi*. We then find a "Description of some new and little known Indian butterflies, with notes on the Seasonal Dimorphism obtaining in the genus *Melanitis*, by L. de Nicéville, F. E. S." Nineteen butterflies are figured. At the May meeting Mr. Sharpe read some notes on Specimens in the Hume Collection of Birds. This is No. 5 of these notes, and is on *Syrnium maingayi*.

At the June 7th meeting were read some remarks by the well-known A. O. H. on the Gnu Goat on Takin (*Budorcas taxicolor*); three horns are figured.

At the June 23rd meeting, a pheasant, *Phasianus komarovi*, from North Afghanistan, presented by Sir Peter Lumsden, was exhibited. A paper was read on a zoological collection made at Xmas Island, Indian Ocean; it is well worth noting that "unfortunately one of the most interesting portions of the collection, *viz.*, the Lepidoptera, was destroyed on its way home, some pieces of camphor having become loose and smashed all the specimens but two." This paper is illustrated.

E. F. B.

CORRESPONDENCE.

CAN SNAKES HEAR?

TO THE EDITOR OF THE "ASIAN."

SIR,—Absence from home prevented my writing earlier anent this interesting subject. I do so now, but before proceeding I may say that I fully agree with the Honorary Secretary of the Natural History Society, Bombay, who wrote as follows:—

"The explanation lies I believe, in the fact that, although snakes cannot hear *air-vibrations*, they are particularly sensitive to *earth-vibrations*, and can, on a dry soil, feel the footfall of any animal at a considerable distance. The result is that one generally gets only a glimpse of the snake as it is making off, and, as the Irishman said of the flea, '*when you get to where he is, he isn't there.*' Tree-snakes may, however, be easily approached, as they lie coiled up in the branches of a bush. The 'checkered water-snake' (*Tropidonotus quincunctiatus*, and the common 'dhaman' (*Ptyas mucosus*) may also constantly be seen lying on rocks 'basking,' or more probably waiting for frogs or small fish. If there is any water between you and the snake it naturally acts as a buffer to the earth-vibrations, and so long as the snake does not see you, you may approach it and talk as loud as you like without disturbing it."

Last week—Xmas—a juggler came round with snakes. I asked him why he stamped his feet or kept dancing when playing his *nagzur* (musical instrument). He replied, venomous snakes cannot hear *air*, but only *earth*, vibrations. I tested his assertion as follows:—

(1.) I placed the *garodiwallah* in front of the cobra playing his *nagzur* and dancing; as usual the snake was charmed.

(2.) I stood motionless in front and placed the juggler at the back of the *Naja*, but *only* playing his horn *without* moving. The snake was quiet, with hood erect and looked *only* at me.

(3.) We reversed positions, but the juggler played his pipe. I stood about three yards behind the snake; there was not a move in it, although I clapped my hands. But when *I moved* the cobra turned round to see "who comes there"?

This is a very interesting subject, and I should much like to have the question ventilated in your columns.

IGATPURI, *28th December* 1887. GHORE PORE.

P.S.—I have a deaf-mute (a tailor); he seems to *hear*, or rather I should say *feel*, the *earth-vibrations*. On the midday gun being fired he gets up and goes for his *khana*. The gun is about three furlongs from my bungalow. The poor man cannot hear the chiming of my clock above his head.

PROCEEDINGS OF THE SOCIETY'S MONTHLY MEETINGS.

No Meeting was held in October.

PROCEEDINGS OF THE MEETING HELD ON 8TH NOVEMBER 1887.

THE usual monthly meeting of this Society took place on Tuesday, the 8th November, 1887, Mr. G. W. Vidal, C.S., presiding.

The following new members were elected:—Lieut.-Colonel J. Biddulph, Mr. E. L. Cappel, C.S., Mr. Ross Knyvett, Mr. E. Thom, Mr. W. Gaye. Mr. G. Carstensen, Dr. G. W. Cline, Colonel Twemlow. R. E., and Mr. Sitaram V. Sukhtankar.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged receipt of the following contributions to the Society's collections:—

Contribution.	Description.	Contributor.
1 Whistling Thrush (alive.)	Myiophoneus horsfieldi ...	Col Græme.
2 Koels (alive)	Eudynamis honorata	Do.
2 Stuffed Fish	From Aden.....	Mr. T. Thorburn.
1 Snake	Dendrophis picta	Mr. H. M. Phipson.
1 Large Sand Piper (alive).	Ægialitis geoffroyi	Mr. G. Ormiston, C.E.
1 Kentish Ringed Plover (alive.)	Ægialitis cantianus	Do.
7 Little Stints (alive).....	Tringa minuta	Do.
1 Common Sand Piper (alive.)	Tringoides hypoleucos.....	Do.
1 Snake (alive)	Simotes russellii.....	Mr. F. Gleadow.
A quantity of Snakes and Lizards.	From Surat and Sind	Do.
A collection of Shells.....	.....	Do.
A collection of Fossils	From Sind	Do.
2 Dolphins	From Alibag	Mr. W. F. Sinclair, C.S.
1 Hyæna's Skin and Skull.	Hyæna striata	Do.
A quantity of Fish, Shells, Crabs and Marine Animals	From Alibag	Mr. W. F. Sinclair, CS.
6 Oyster Catchers	Hæmatopus ostralegus.....	Do.
2 Curlews	Numenius lineatus	Do.
A quantity of Turtles' Eggs.	From Alibag	Do.
A quantity of Whales' Teeth	.....	Mr. T. Thorburn.
A number of Fossils	.....	Do.
1 Snake (alive)	Dipsas gokool	Mr. H. O'Connor.
1 Fox(alive)	Vulpes bengalensis	Mr. W. W. Saunders.
1 Snake	Zamenis fasciolatus	Miss Whitcombe.
1 Hare (alive).....	Lepus nigricollis	Mr. N. V. Mandlik.
1 Snake	Daboia elegans	Mr. C. E. Kane.
1 Chameleon (alive)	Chameleo vulgaris..... ..	Mr. J. Hatch.
2 Snakes	Echis carinata and Gongylopis conicus	Dr. Mallins.
1 Sambur's Head	From Mauritius	Capt A. Moore, R. N.
1 Yellow breasted Ground Thrush (alive)	Pitta bengalensis	Mr J. Klingelhofer,
1 Crow	With curiously deformed beak.	Mr. S. P. Leggett.
2 Large Grey Quails	Coturnix communis	Mr. G. Ormiston, C.E.
1 Chameleon (alive)	Chamelio vulgaris.....	Mr. H. Barrett.
2 African Partridges.....	From Zanzibar	Mr. W. H. Walker.
1 Snake	Echis carinata	Dr. Gaye.
Black Buck's Leg	Curiously deformed	Dr. A. K. Stewart.
Larvæ and pupæ of	Eryolii taprobana	Mr. J. Davidson, C. S.
1 Grey parrot.....	Psittacus erythacus	Mr. F. C. Limjee.
4 Snakes' Eggs	Tropidonotus stolatus	Mr. H. Bicknell.
1 Yellow breasted Ground Thrush (alive).	Pitta bengalensis	Mr. E. Thom.
1 Snake	Callophis nigrescens.....	Mr. Shankar Pandit.
1 Snake (alive)	Passerita mycterizans	Dr. Weir.
1 Hyæna's Skull	Hyæna striata	Mr. H. S. Wise.
1 Crocodile's Skull.....	Crocodilus palustris	Do.
1 Jackal's Skull	Canis aureus	Do.
1 Panther's Skull	Felis pardus	Do.
1 Wild Cat's Skull.....	Felis chaus.....	Do.
2 Painted Bats	Kerivoula picta	Do.
A quantity of Insects.....	From Karwar.....	Do.
1 Python's Skin	Python molurus.....	Do.

Contribution.	Description.	Contributor.
15 Snakes	Ophiophagus elaps, Bungarus arcuatus, Typhlops brahminus, Lycodon aulicus, Python molurus, Hypnale nepa (three), Trimeresurus strigatus, Onychocephalus acutus, Tropidonotus plumbicolor, Simotes Russellii, Oligodon subgriseus.	Mr. N. S. Wise.
A number of Land Crabs and other Crustaceans.	From Karwar	Do.
5 Crocodiles' Eggs	Crocodilus palustris	Do.
1 Lizard.....	Gymnodactylus deccanensis.	Do.
A quantity of Scorpions and Centipedes.	From Karwar.....	Do.
A quantity of Fungi	From Aurungabad	Mr. Frank Rose.
Nest of Alpine Swift	Cypsellus melba.....	Mr. J. Davidson, C.S.
Nest of Palm Swift.....	Cypsellus battassiensis ...	Do.
Nest of Crested Tree Swift .	Dendrochelidon coronata...	Do.
Several Birds' Eggs	From Yercaud	Mr. W. Mahon Daley.
3 Birds' nests	From Rutnagiri	Mr. H. F. Hatch.
1 Camel's Skull	Camelus dromedarius	Mr. F. G. Lynde.
1 Chameleon.....	Chameleo vulgaris	Mr. Chas. B. Beatty.

MINOR CONTRIBUTIONS FROM

Mr. Pestonjee J. Jhabvala, Dr. Weir, Miss Barnes, Mr. Clubildas Lulloobhoy, Mr. J. de Souza, Mr. H. Bicknell, Mr. W. F. Melvin, Mr. W. W Squire, Mr. H. Ganthorn, M. Kaikobad C. Adenwalla, Mr. Tribhovundas Munguldas.

CONTRIBUTIONS TO THE LIBRARY.

Proceedings of the Linnæan Society of N. S. Wales, Vol. II., Part 2.

Proceedings of the Royal Society of Victoria, Vols. XXII., XXIII.

A Catalogue of the Moths of Ceylon, Part I.

A Manual of Comparative Anatomy of the Domestic Quadrupeds; by Dr. N. H. Eduljee Sukhia.

Procés-verbaux des Seances de la Société Royale Malacologique de Belgique, Tome XVI.

Journal of Comparative Medicine and Surgery, New York, October 1887.

Mr. H. S. Wise exhibited a large collection of butterflies, recently made by him in the Canarese Districts, which was greatly admired. A special vote of thanks was passed to Mr. Wise for the numerous contributions to the Society's Museum.

The Honorary Secretary stated that Mr. R. A. Sterndale, who had edited the Society's Journal since 1st January, 1886, was now about to leave Bombay for Madras. This news was received with many expressions of regret from the members present, and a special vote of thanks was passed to Mr. Sterndale for the valuable services he had rendered to the Society since its commencement. Lieut. H. E. Barnes then read a most interesting paper on the Nesting of the Indian Hirundines, which will be found in another part of the number of this Journal.

PROCEEDINGS OF THE MEETING HELD ON 5TH DECEMBER 1887.

THE usual monthly meeting of this Society took place on Monday, the 5th December 1887, Dr. D. MacDonald presided, and a large number of members were present.

The following new members were elected:—Mr. A. Elliott, C.S., Captain R. C. Dixon, Mr. H. W. J. Bagnell, C. S. Mr. John M. Heyn, Dr. W. E. Cates, Mr. E. Mitchell, Mr.

A. Leslie, Mr. W. J. B. Clerke, C.E., Mr. J. H. Symington, Rev. J. F. W. Gompertz, Mr. Geo. E Mason, Major Sawyer, and Dr. Balchandra K. Bhatvadekar.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged receipt of the following contributions to the Society's collections :—

Contribution.	Description.	Contributor.
1 Snake (alive)	Trimeresurus erythurus, from Moulmein,	Capt. Jones.
1 Cuscus (alive)	Phalangista ursina	Mrs. Potts.
1 Hamadrayad or King Cobra (alive).	Ophiophagus elaps (12 feet in length)	Mr. H. T. Ommaney, C.S.
3 Snakes	Trimeresurus anamallensis. Dipsas gokool. Cynophis malabaricus	Hon. Mr. Justice Scott.
A Collection of Birds' Skins from New Guinea.	.....	Marchese Giacomo Doria.
1 Snake (alive).....	Daboia elegans	Mr, J. Brand.
1 Snake (alive).....	Gongylophis conicus	Mr. H. G. Cowper.
1 Snake (alive)	Sillybura macrolepis.....	Mr. H. Wenden, C.E.
1 Snake (alive)	Hydrophis diadema	Mr. J. M. Cursetjee.
1 Snake (alive)	Daboiaelegans	Mr. Bulwant Jayaram.
1 Ostrich's Egg, laid in Bombay.	.....	Mr. H. W. Barrow.
1 Snake	Daboia elegans	Mr. C. E. Kane.
1 Monitor (stuffed)	Varanus dracæna	Mr. T. Thorburn.
1 Skull of a Hybrid between a wolf and a dog.	.....	Mr. Frank Rose.

MINOR CONTRIBUTIONS FROM

Rev. E. S. Hall, Mr. T. Lidbetter, and Mr. G. W. Terry.

CONTRIBUTIONS TO THE LIBRARY.

The Journal of Commparative Medicine and Surgery (27 numbers); the Records of the Geologial Survey of India, Vol. XX., Part 3; Bulletin of the California Academy of Science, Vol. II., No. 6; Bulletin of the American Museum of Natural History, Vol. II., No. 1; a File of the *Asian* from Mr. R. A. Sterndale; Viaggio di L. Fea in Birmania, from the Marchese Doria. Transaction of the New Zealand Institute, Vol. XIX; Journal of the Asiatic Society of Bengal.

Five handsome markhor heads and three ibex heads, mounted by the Society for Major Pengree, R. A., and collected by him in Cashmere, were exhibited.

Lieut. H. E. Barnes also exhibited some beautiful specimens of Corals from Singapore, collected by Mr. Nelson, s.s. "Lalpoora."

A special vote of thanks was passed to the Marquis Giacomo Doria, the Director of the Museum at Genoa, for his contribution of rare birds' skins from New Guinea.

A vote of thanks was also passed to Mr. H. T. Ommaney, C.S., for his valuable present of a full-grown live specimen of the Hamadryad, or King Cobra (Ophiophagus elaps), which was greatly admired by all the members present.

The Honorary Secretary read a statement, received from Mr. Ommaney, containing particulars relative to the capture of the snake in the Canarese jungles on the Hyder Ghat Road.

Mr. W. F. Sinclair, C.S., then gave a most interesting lecture on the "Common Objects of the Sea Shore," which, owing to the lateness of the hour, he was unable to finish. A vote of thanks was voted to Mr. Sinclair, and the meeting then ended.

BLACK ROCK-SCORPION (BUTHUS AFER)

(found at Khandala, Western Ghauts).

Exemplifying simultaneous twin-parturition.

Photo-Collotype, Survey of India Offices, Calcutta, February 1888.

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WATERS OF WESTERN INDIA.

(Supplementary Note.)

After the publication of that part of these notes dealing with the Konkan and Bombay Coast, several members made valuable additions to my rough list of birds, and my own observations enable me now to supplement that Chapter with some new details.

Amongst Cetacea, the Bhulga (*Neomeris karachiensis*) is now represented by several specimens in the Victoria Museum and our own. Formerly, I believe, Mr. Murray's type specimen was unique. Of the "Gadha," or large deep-water porpoise, we have got a fine specimen, identified by Mr. Sterndale as *Delphinus lentiginosus*; which is, however, not always now distinguished as a separate species from *D.* (*Sotalia*) *plumbeus*.

Amongst Birds, I have myself obtained a Swallow Plover (*Glareola orientalis*), out of a flock of a dozen on the wide pastures of Rewadanda; and a specimen of the Grey Plover (*Squatarola helvetica*) was brought to me from the same place, which is a favourable *habitat* for most Plovers. Mr. Inverarity first corrected my belief that the Indian Golden Plover was at least rare here; and since that I have found it myself in April and September in the valley of the Kundlika, half-way between Rewadanda and Rone. At this point there is a large area of grassy saltmarsh, where the

Golden Plover is said by the native fowlers to breed; and this is not impossible, as it does so in much more southern latitudes, and the ground is as good an imitation as our Province can afford of the breeding grounds frequented by its European cousin.

Of the *Hœmatopodidœ* (misprinted Hæman*t*opodidæ in my paper) I have seen a good deal since it was written. I have verified the presence of the Crab Plover by inspection of a fresh specimen brought in to me from Nagaum Sands, and have received seven of the Oyster-catcher, which deserves remark.

Jerdon gives the truncated bill as a characteristic of the genus Hæmatopus, of which he mentions that "several species are recorded, chiefly from America, one or two from Australia, and one from Africa." He identifies our bird with that of Europe; and gives the colouration of its bill as "orange-yellow dusky anteriorly." These were the colours in all my specimens; and those of their plumage agreed with what he says of young birds before and after the first month; but *in no case was the bill truncated.*

I have several times killed and handled adult specimens in Ireland, and in all of these the truncation was as marked as in a clay tobacco-pipe broken short off, and the colour a bright-red. Mr. Murray, in the "Vertebrates of Sind," gives this colour (which I have not seen in India), but does not notice the truncation of the beak.

The editor of the *Field* in a short answer to a note on the subject, suggests that this may be the result of wear in use. Lieutenant Barnes, whom I had the privilege of consulting, appeared to lean to this view; but in his book he has followed Jerdon.

The upshot of the matter is, so far, that the truncation of the beak must disappear, as a *generic* character, from future notices of the species. If it is to be retained as a specific character, our bird is different from that of Europe, as our Golden Plover is; for a mere result of wear cannot be treated as identifying either a genus or a species, and if this is the cause of truncation, our bird may well enough be identical with *Hæmatopus ostralegus*, and the *colouration* of the bill characteristic of the young bird only. The bird is a permanent resident, and probably breeds here.

Amongst Longirostres I have lately obtained the Avocet Sandpiper (*Terekia cinerea*) for the first time. The specimen was one of a small flock on the Nagotna Creek, and I have observed a dozen Avocets (*Recurvirostra avocetta*) on the salt-pans near Pen.

Under the head of *Anatidæ*, I have an important correction to make, as a freshly-killed Mallard was lately brought in to me at Nagotna. It was in full plumage, bar a few plumes; the curly tail feathers were well developed, and after careful examination and comparison with Jerdon's description, there could be no doubt about the bird. It is true that tame drakes sometimes assume a plumage closely resembling that of their wild ancestors; but these can, I think, generally be distinguished by the bill, which is more yellow in the domesticated bird, except where the wild blood has been very lately renewed by crossing. The *proof*, however, is like that of puddings, in the *eating*. I instituted autopsy of my bird upon that principle, and have no doubt whatever that he was a genuine Mallard. This is, perhaps, the most southern record of the species. "Our only Gannet" has been identified as *S. cyanops*.

Amongst fishes and reptiles I have no novelty worth recording here; but of Molluscs I have received many specimens of *Chitons* and *Linguloe*.

KESWAL.

THE BIS COBRA.

BY G. W. VIDAL, C.S.

(*Read at the Society's Meeting on 4th January*, 1888.)

IN that charming and inimitable little book, "The Tribes on my Frontier," which delights all who read it,—and of which our Society has special reasons to be proud—there is a characteristic description of the bis cobra, which will serve admirably as the text of the remarks I have to make. "But of all things in this earth that bite or sting the palm belongs to the bis cobra, a creature whose very name seems to indicate that it is twice as bad as the cobra. Though known by the terror of its name to Natives and Europeans alike, it has never been described in the proceedings of any learned Society, nor has it yet received a scientific name. In fact, it occupies much the same place in science as the sea serpent, and accurate information regarding it is still a *desideratum*. The awful deadliness of its bite admits of no question, being supported by countless authentic instances; our own old *ghorawalla* was killed by one. The points on which evidence is required are—first, whether there is any such animal as the bis cobra; second, whether, if it does exist, it is a

snake with legs, or a lizard without them. By inquiry among natives I had learned a few remarkable facts about it; as, for instance, that it has eight legs and is a hybrid between a cobra and that gigantic lizard commonly miscalled an iguana; but last year a brood of them suddenly appeared in Dustypore, and I saw several. The first was killed by some of the bravest of my own men with stones, for it can spring four feet, and no one may approach it without hazard of life. Even, when dead, it is exceedingly dangerous, but, with my usual hardihood, I examined it. It was nine inches long, and in appearance like a pretty brownish lizard, spotted with yellow. It had no poison fangs, but I was assured that an animal so deadly could dispense with these. If it simply spits at a man, his fate is sealed; for, excepting a few cunning Bengalees, no one knows any *muntra* or charm which has power against it. Afterwards one appeared in my own garden, and I made an attempt to capture it alive with a butterfly net, my devoted butler's hair turning grey as he watched me from a great distance; but the bis cobra got off into a hole. It escaped me once or twice again, and then finding I was bent on catching it, it gradually changed colour like a chameleon and grew larger at the same time, until in a few weeks it had developed into an unmistakable iguana. Some people would jump to the conclusion that it was a young iguana to begin with. My butler would endure the thumb-screw sooner."

It is, perhaps, an unusual proceeding to undertake to read a paper on a certain animal and then to deny its existence *in toto*; but this is what I have to do. There is no doubt that a large number of human beings do believe—and probably always will believe—in the existence of venomous lizards in India, and of the bis cobra in particular. If any such believers are present here to-day I hope to be able to convince them that the mysterious bis cobra, of which we hear now and again, is merely our old friend Mrs. Gamp's own particular Mrs. Harris in another sphere of life—a transmigrated Mrs. Harris, in fact, and that, as far as India is concerned, there "aint no sech a person." The origin of the word bis cobra is in itself a mystery. It is neither wholly Oriental nor wholly European, but apparently a barbarous compound, which may be justly repudiated by all decent languages. "E H A" in his playful manner affects to believe the name implies that the animal is *twice* as poisonous as a *cobra*. But the learned author of Hobson-Jobson will not admit that the name has anything to do with either *bis* in the sense of *twice*

or *cobra* in the sense of *snake*; he contends that bis is *bish*, the Hindustani word for poison, and that *cobra* is probably a corruption of *khopra* or *khapra*, the vernacular word for "a shell" or "a skull." Hobson-Jobson is no doubt right about *bis* being *bish*, poison. But his derivation of cobra from *khopra*, a shell, seems far-fetched and fanciful. Had the term bis cobra ever been used to denote a venomous cockle or a poisonous periwinkle, the derivation would have been plausible enough. But though cockles, winks, *et hoc genus omne*, may be poisonous in the sense that they sometimes disagree with frail mortals, if indulged in too liberally, I don't think they have ever yet been called bis cobras, or endowed by the wildest romancers with the attributes popularly ascribed to the latter. I am inclined, therefore, to believe that *cobra* in biscobra does after all mean *cobra*, which, as we all know, is the Portuguese rendering of the Latin *coluber*, a snake, and I can only conjecture that the original discoverer of the bis cobra was rather mixed as to the distinctive characters of snakes and lizards. Possibly the creature to which he applied the name, and which has unfortunately not been preserved as a type specimen, was one of the skinks, a family of lizards, which would be very like snakes indeed, to all outward appearance, if they lost their legs. The derivation of the name would be of little consequence if we could fix the creature itself, and confidently refer it to any single species. We are unfortunately used to all sorts of atrocities in the nomenclature or mis-nomenclature of animals. We might leave etymologists to wrangle over the name, if the identity of the bis cobra were not such a hopeless puzzle. One day it is one lizard, and the next day another. Almost every harmless lizard in its turn seems to be branded as the genuine bis cobra. It is useless to demonstrate that any particular species declared by "One who knows" to be the real article, is a common harmless lizard; for the next day a totally different, but equally harmless, species will be produced as the true bis cobra by "One who knows better." All the families into which lizards are divided contribute from time to time to swell the ranks of venomous lizards. It is impossible to give any exhaustive list, but I will here mention a few which figure more often than others as bis cobras. First, there is the common and well-known Indian water lizard or monitor (*Varanus dracœna*), the "Ghorpad" of the Mahrattas, the "Goana" of Ceylon. This is the species which is so frequently miscalled the iguana by Europeans in India, and probably identical with "E H A's" brood of Dustypore

bis cobras. We have several specimens in our collection. The stuffed monitor before us is too large for a bis cobra. But young monitors, which are more conspicuously marked than their elders, by white *ocelli* and dark cross bands, are often called bis cobras in Sind and Cutch. The natives of Southern India are also said by Dr. Shortt to hold monitors in deadly fear. Not only is their bite fatal, but they hold on with such bull-dog tenacity, that they will not relinquish their enemy till a donkey brays, which soothing noise, according to local superstition, operates on them as a charm and turns away their wrath. It is needless to say that the monitor is quite innocent of venom, though its bite is no doubt severe, and though it can administer a very punishing stroke with its tail. Many funny stories are told of this species. Perhaps the funniest of all is the old Mahratta legend that the ancestor of the well-known family of *Ghorpares*, originally a *Bhonsle*, like Sivaji, changed his name to *Ghorpare* after a very daring exploit he achieved with the aid of a Ghorpad. This exploit was nothing less than the scaling of a fort in the Konkan—hitherto deemed impregnable—by availing himself of the services of a friendly Ghorpad to pull him up the wall by means of a rope fastened to the animal's tail. Now these lizards have, as you see, very strong claws with which they can no doubt hold on even more firmly than with their teeth. Their skin is also remarkably tough, and for this reason is, I believe, in great demand for tom-toms. But I should not advise any enterprising member of this Society to follow the example of the ancestor of the Ghorpares, at all events unless the ditch below the fort wall he selects for the experiment has a good ten feet of water in it. Ghorpad—as perhaps you know—is eaten and thought a great delicacy in various parts of the country, especially in Ceylon. This seems strange considering the horror in which it is held in other parts. Kelaart, the naturalist, tells us that he had some excellent soup made of a Ghorpad, and that it tasted very like hare soup. This, however, is another example which I should hardly recommend any one to follow. Another and more handsomely marked species of this same family, the ornate monitor (*Psammosaurus scincus*), the *Chandengo* of Guzerat, is also not unfrequently passed off as the bis cobra, probably from its resemblance to the young of the common *Ghorpad*. Thus the monitors which are forked tongued lizards contribute at least two species to the army of bis cobras. Next come the Geckos, with short thick tongues and adhesive toes, some of which live in

our houses and others in rocks and trees. This family contributes more bis cobras than all the rest put together. In the North-West Provinces, as I find from a letter from "Young Nimrod" in the *Asian* of November 23rd, 1880, all Geckos are called bis cobras indiscriminately. Another correspondent of the same paper declares that *the* bis cobra *par excellence* of the North-Western frontier is Hardwick's Gecko (*Eublepharis Hardwickii*, Gray), a stout-bodied nine inch lizard, which is not very common. The same species is also, according to Dr. Shortt, *the* bis cobra of India. "Some years ago," he writes in an interesting note in the *Madras Monthly Journal of Medical Science*, "I saw some articles in the Madras papers about this reptile (*Eublepharis Hardwickii*), which made it out to be the most poisonous creature with or without four legs, and one or two of the officers who were in service in Bengal mention that several sentries were found dead at their posts from the bite of some creature, which was afterwards found, and which I took to be, the bis cobra from the description they gave of it." In Burmah, again, there are two large Geckos (*Gecko guttatus*, Dana; and *Gecko stentor*, Cantor) which are widely believed to be exceedingly venomous, and are consequently held in great dread. These deadly reptiles are not, however, called bis cobras, or by any other names conveying an idea of their poisonous nature. Their local name "Tuctoo" is a very innocent one, and merely an imitation of the loud note with which they and other members of the same family frequently relieve their feelings; and which sounds like "tuck," "tuck," "tuck," repeated in a crescendo scale. Dr. Shortt had a specimen of *Gecko guttatus* sent to him for examination by a correspondent with the following description:—"This is the Tuckatoo of the Burmese, a large species of lizard found in Burmah, inhabiting trees and seldom ever seen, and heard only at dark and during the night: it is of a dark ash colour spotted with red, but the old ones are much darker in colour, as are also the spots. Their first cry begins with a croak, and then they sing out tuckatoo, tuckatoo, quite slow and then in a quicker time. The same word is repeated for a few seconds, and then another croak, and all is still. Their voice is quite loud and hoarse and heard at a great distance. The Burmese, as well as other natives, dread this reptile, as their bite is poisonous, and their hold so tenacious that they can only be cut off the body of the person they fall on. The Burmese say that when any one is bitten their body swells to a great size, and they seldom live over a day." In Southern India again,

according to the same authority (Dr. Shortt), the Bengal Gecko (*Hemidactylus cocteaui*, D. et B.), is dreaded, more especially the larger kinds found about rocks and trees. Then again some gross calumniator has dared to take away the character of our old friend the chameleon (*Chameleo vulgaris*, Lin.), the *Sasumba* of Cutch, and *Guhira Sarad* of the Deccan. Any one who has watched the child-like and bland expression of the pet chameleon, whose life was made so happy in these rooms by Mr. Phipson's tender care, will find it hard to believe that he is a deadly monster, whose bite is instant death. Nevertheless, he has not been allowed to escape the stigma of being called a bis cobra. According to Dr. Fairbank, he is the bis cobra of Guzerat, and Dr. Shortt relates a story showing the extreme dread in which he is held in Madras: "When *Zillah* Surgeon of Chingleput," he writes, "I remember on one occasion a native came running to my house: he was almost breathless, streaming with cold perspiration, looking pale, skin cold, pulse small, holding the thumb of his left hand in his right, and complaining of being bitten by a chameleon on the tip of his left thumb, and requesting with tears in his eyes that I would do something to save his life. Nothing that I could say convinced him that the chameleon was harmless and the bite not poisonous, but to satisfy the poor fellow I applied some *liquor ammonia* to the part said to be bitten, where there was a slight abrasion of the skin, and gave him a little brandy and water to drink. He sat down for a time in my verandah, and then went away apparently quite well. That the man was in a great fright about his life there was no doubt from the state of his pulse, skin, and general appearance, when he presented himself to me." It is needless to state that all the lizards mentioned above are perfectly harmless. The Skinks, the ground lizards, the sand-fish lizards and the pretty little Dragons, or flying lizards, have hitherto, it appears, escaped the unneviable notoriety of being called bis cobras. So also has the familiar Bloodsucker (*Calotes versicolor*, Dana). This is odd, as in his scarlet war paint the Bloodsucker is one of the most formidable looking lizards we have. That very uncanny Australian lizard, the Moloch, of which we have a good specimen here, is another species which if found in this country would hardly escape being called the true bis cobra. I have little doubt, however, that *some* day, when the most credulous have begun to believe in the innocence of monitors, geckos and chameleons, all the lizards mentioned above will have their turn. They offer at least a wide field for the selec-

tion of future bis cobras. The belief in poisonous lizards is by no means confined to India. It may safely be said that there is no known species of lizard in the old world which is provided with glands for secreting venom, or fangs through which to eject it. Nor are there any lizards in India whose dentition is in any way suspicious.

It must, however, be admitted that there is rather strong evidence, if not actual proof, as to the existence of a venomous lizard in Mexico. This is the Mexican Heloderm (*Heloderma horridum*, Wiegmann), a species of the monitor family. Mr. Tegetmeier has written an interesting account of this reptile in the *Field* of August 19th, 1882. The Heloderm was first described by Dr. Wiegmann in 1829. It had long been held to be venomous by the inhabitants of the tract in which it is found, that is the hot zone of Mexico. Dr. Wiegmann called attention to its peculiar dentition, which seemed to confirm in great measure the popular belief in its poisonous nature. For although there were no signs of poison glands, as in the case of venomous snakes, it was found to have recurved grooved teeth, through which its saliva, whether poisonous or not, could be introduced into the puncture made by its bite. Dr. Wiegmann himself does not appear to have believed that the Heloderm was really a venomous species, and he made no experiments to test the matter. Many years later, a French naturalist, Sumichrast, took up the subject again, and wrote a more detailed account of the Heloderm in the *Comptes Rendus* of 1875. He also procured and sent preserved specimens to Paris. According to Sumichrast the animal has a strong nauseous smell, and when irritated secretes a large quantity of gluey saliva. "In order to test its supposed poisonous property"—I am quoting from Mr. Tegetmeier—"he (Sumichrast) caused a young one to bite a pullet under the wing. In a few minutes the adjacent parts became violet in colour, convulsions ensued, from which the bird partially recovered, but it died at the expiration of twelve hours. A large cat was also caused to be bitten in the foot by the same Heloderm; it was not killed, but the limb became swollen, and the cat continued mewing for several hours, as if in extreme pain." Mr. Tegetmeier further writes that the dead specimens sent to Europe were carefully examined as to the character of the teeth. Sections were made, which demonstrated the existence of a canal in each tooth, totally distinct from and anterior to the pulp cavity; but the soft parts were not examined with sufficient care to determine the existence or otherwise of any

poison gland in immediate connection with the perforated teeth. Nothing further was heard of the Heloderm until 1882, when a live specimen, 19 inches long, was presented to the Zoological Gardens by Sir John Lubbock. The arrival of this interesting stranger caused quite a little sensation at the time amongst the naturalists of Europe. Mr. Tegetmeier tells us that for some days it refused all kinds of food. A live frog, a guinea pig, and several rats, however fell victims to its bite. The frog died in convulsions immediately after it was bitten. The guinea pig (bitten in the hind leg) died convulsed in three minutes, while some young rats perished even more quickly. After a time it was found that eggs were the particular food which the Heloderm fancied, and these it disposed of very readily. It was expected that further systematic experiments would be made to test the poisonous character of this lizard, and that the results would be published. Whether such experiments have been made or not, and with what result I should be glad to know; for I have not been able to come across any record of them.

Fortunately no "horrid" Heloderm has yet been found in India, nor any other lizard with similarly suspicious teeth, to justify the believers in the bis cobra. The origin of the belief in poisonous lizards in this country is not easy to trace. Dr. Shortt, writing of Southern India, thinks that a certain learned work in Tamil called the Sittar Vedum, or work of the "Seven Sages," which can be had in the bazaars for two or three annas, and which is a very popular book, is to a large extent responsible for the absurd beliefs of that part of the country. This book, he tells us, gives an account of all poisonous animals, including in the same category snakes, centipedes, spiders, beetles, lizards, dogs, cats, tigers, and monkeys. A similar work is said te exist in Ceylon. As regards Bombay, the Deccan, and the Konkan, I am inclined to think that Europeans are quite as much, if not more responsible than, natives for the propagation of wild stories as to snakes and lizards. I have myself very seldom heard a native of these parts asserting the deadly character of any lizard, though they are very ready to take away the character of the most innocent snakes. The touch of a lizard is, I believe, generally considered a pollution by Hindus, but the bis cobra, according to my experience, is a creature of European, quite as much as of native, imagination. Hindus, however, whether they believe any lizard to be venomous or not, have some wonderful superstitions concerning them. The omens portended by the various ways in which a lizard

can present itself to man or boy, wife or maid, are so many in number, that it must take a man or woman all his or her life to learn them. This must be rather awkward, as the fulfilment of the omen must in many cases precede the knowledge of what is coming; and if the omen is a bad one, deprive the victim of all chance of averting it by recourse to the various mysterious ceremonies prescribed for the purpose. If any one is interested in the subject, a paper on "Omens from the falling of house lizards," contributed to the *Indian Antiquary* by Mr. K. Raghunathji, will repay perusal. From the exhaustive list of omens given in this paper, we can see what will happen to us when a lizard falls on any part of us from head to foot. These omens have little or nothing to do with the subject of bis cobras, and there is no time now to describe them in detail or to attempt to trace their origin. I cannot, however, refrain from mentioning a few of them for your comfort, or discomfort, as the case may be. Men will be glad to hear that if lizards fall on their noses it is lucky. But the dividing line between joy and grief is so very thin that if the lizard touches the tip of the nose the result is extremely calamitous. This is like a warning to men with prominent hooks not to carry their noses too high in the air. Men also may or may not be pleased to hear that if a lizard falls on their left cheek, they will be blessed with a sight of their deceased relations. But the luckiest thing of all is for a lizard to fall on the soles of a man's foot; for then all his enemies will surely perish. This is an event which I fear is not very likely to happen to many of us, unless we habitually stand on our heads, or make a point of sitting expectantly for hours together every day in the position taken up by the Japanese gentleman in Chiarini's Circus. Ladies will be glad to know that if a lizard falls on their left cheek, they will meet not their deceased relatives, but their beloved. There will be misery if one falls on their right eye, but grass widows may be consoled by the thought that a lizard on their left eye is a certain sign that they will meet their absent husbands. Lastly, immense wealth and a son are hers on whose left foot a lizard falls, and she will be rich in grain if one falls on her toe nails.

VENOMOUS LIZARDS.

TO THE EDITOR OF THE "BOMBAY GAZETTE."

SIR,—In your article of 7th inst. you call attention to the following words, which occur in the paper I recently read at a meeting of the Natural History Society. "It may safely be said that there is no known species of lizard in the

old world, which is provided with glands for secreting venom, or fangs through which to eject it." You ask, with reference to this passage, if the time has come for saying that none of the Indian lizards are poisonous. If you refer to *known* species—that is, species which have been examined, described, and named by competent authority, your question may be confidently answered in the affirmative. My remark is, of course, limited to such species. He would be rash, indeed, who would deny the *possibility* of a venomous lizard being discovered in the old world. There are still tracts in the Himalayas, and elsewhere in Asia, of which the zoology has been very imperfectly, if at all, observed, and where the local bis-cobras, if not bis-cobras, may at least turn out to be "boojums." Nothing that I have said is in any way inconsistent with the admission that another "horrid" heloderm *may* be found in India, slight though the chance of such discovery may be. The assertion that there is no *known* species of venomous lizard in the old world is, I need hardly say, *not* made as a hasty deduction from personal observation. It expresses, as far as I can ascertain, the conclusion of all the leading authorities on the subject. This conclusion is obviously strengthened by the fact—to which I drew prominent attention in my paper—that all the specimens of lizards commonly produced as bis-cobras belong to species already well-known to be innocuous.

You are quite right, however, in stating that the Statistical Abstract shows that in 1884 and 1885 four to seven persons, respectively, were killed by lizards. I might add that in each of the preceding years, 1882 and 1883, one person is said to have died from a similar cause. Most of these casualties occurred, I believe, in Guzerat. I have a dim recollection of having myself, while in Broach, examined an inquest report declaring a man or a woman to have been killed by a *chandengo* (the local name of the two harmless species of monitor lizards, *Varanus dracæna* and *Psammosaurus scincus*).

Some irresponsible critics affect to believe that the annual official returns as to deaths caused by wild animals and snakes are not worth the paper they are printed on; that all sorts of murders and dark deeds are covered conveniently and safely by the mortality for which snakes and "other animals" are officially held responsible; and that "snake poison" is merely a happy and conventional way of alluding to the "cup of cold poison" which terminates domestic disputes, and gets rid of people who make themselves disagreeable. My faith in the accuracy of the returns has never been materially weakened by these and similar reckless insinuations. I will therefore admit, for the sake of argument, that these alleged victims were really bitten by lizards, and died after being so bitten. I prefer to meet whatever evidence the returns may give against me boldly and on its merits, and scorn to shelter myself behind the plea that a man, declared by a village *punchayat* to have been killed by a lizard, may have had a dose of arsenic.

But I reject the inference which the believers in the bis-cobra will naturally draw from these reported deaths. Admitting that death in each of these cases followed the bite of a lizard, it by no means follows that death was due to the action of any *poison*. Those who, like myself, refuse to believe, on the evidence before us, that there are any venomous lizards in this country, will say that the direct and immediate cause of death in these cases was *fright*, and fright only aided

possibly by a diseased condition of the heart. I believe that nothing is more certain than that grossly ignorant and superstitious subjects, bitten by harmless snakes and even by lizards, do occasionally die from pure fright. Many doctors, I fancy, could quote instances in support of this statement from their own experience.

Here are two cases recorded by Dr. Russell, the pioneer of ophiology in India, from which those interested in the question may draw their own conclusions. Case No. 1.—"Two sepoys at Rajamundri were bitten in the same night by the same snake, which was described as being 'scarcely six inches long, about the size of a large goose quill, of a dark straw colour, a flat head, with two very small eyes, which shone like diamonds, and behind each eye was a black streak about three-fourths of an inch long.' The first man bitten died after six hours. He said and felt that death was inevitable directly he was bitten. The second man bitten within a minute of the first, died within eleven hours. Neither man, it appears, suffered visible pain or convulsions, but passed away in a kind of stupor." Case No. 2.—"The porter of Mr. Bourchier, Governor of Bombay, a *very stout* Arab, was bitten by a very small serpent, and died *almost instantaneously* after exclaiming that a snake had bit him." The italics are mine. Dr. Russell's information was got from the Governor's son, Mr. James Bourchier, who spoke from memory, and added "that the snake to which the man's death was imputed was by the Portuguese called cobra de morte; that in the course of twenty years he had only seen two of them, one on the island of Bombay, the other in his own house at St Thomas's Mount, near Madras; that the length of the snake was from six to nine inches; its thickness that of a common tobacco pipe; the head black with white marks, bearing some resemblance to a skull and two cross bones; the body alternately black and white, in joints the whole length; and that its venom is of all others the most pernicious."

Dr. Russell, it must be admitted, has not suggested that the death of the two sepoys, and the very stout Arab, evidently stouter in body than heart, was due to fright. He made no comments, and possibly believed that the snakes described were as deadly as they were said to be. Very little was known in those days on the subject of venomous snakes. Local superstitions were too deeply rooted to be shaken by the little exact knowledge then available. The diminutive cobra de morte was then a living tradition, and its existence not to be rashly questioned. But can any one now believe that the diminutive snakes described, even if immature specimens of venomous species, were capable of causing the death, *by their poison alone*, of the two sepoys and the stout Arab? From the descriptions given it is impossible to say what the snakes in question really were. But they are certainly more likely to have been harmless than venomous species, and the description of Mr. Bouchier's snake, to whose bite the stout Arab succumbed "almost instantaneously," reads uncommonly like that of the familiar and innocent little *lycodon aulicus*. This theory of death by fright is not a new one. In commenting on the same cases, in a chapter on the snakes of the Poona district, contributed to the *Bombay Gazetteer* some years ago, I ventured the same explanation of the cause of death, observing that the "cobra de morte, like the mythical bis-cobra or poisonous lizard, has no real existence; but whereas the latter name is still

applied to various specious of lizards, known to be innocuous, the cobra de morte is now, whatever it once was, a name and nothing more." Dr. Fairbank also in his "Bombay Reptiles," writes of the Ornate Ghorpad as follows:—"It inhabits Sind and Cutch, and there it is called *chandengo*, and its bite is thought poisonous. No lizard has a poison sac or fangs. The saliva may become an irritant when the lizard gets much vexed as that of a wharf rat does. Some lizards spring fiercely and bite severely, and some snakes that are not venomous do the same, and many persons bitten by such reptiles have died, *not from poison, but because they believed themselves poisoned.*"

The extract from Dr. Shortt's note which I quoted in my paper on the bis-cobra, is another good instance in point. There was a man bitten by a chameleon. As there is only one species of chameleon in India there can be little, if any, doubt as to the identity of the lizard. Few will be bold enough to assert that the chameleon is a *venomous* reptile. But the man *believed* it was, and his belief remained unshaken. Despite all Dr. Shortt's assurances, the symptoms of fright were alarming enough. He was "almost breathless, streaming with cold perspiration, looking pale, skin cold, pulse small," &c. In this case the poor man did not die. Why?—Because he had faith in the doctor's remedies, and was comforted by brandy and water. A bread or sugar-pill would probably have had the same effect. But what might have been the fate of that man without the doctor and his brandy and water?—He would have gone to his house and his friends and relations would have crowded round him, shrieking and wailing, telling him it was all up with him, till the poor wretch would have been seized with convulsions and died. I have myself seen a woman as near death as possible under very similar circumstances. She was working quietly in the garden. All of a sudden she gave a shriek, and muttering something incoherently about a snake, went off into violent convulsions. The doctor was sent for, and he succeeded with some difficulty, and after some hours, in getting her round. The snake was killed. It was a harmless one, and had not even scratched her! She admitted afterwards that she had not been touched by the snake. But she had been told—and of course believed—that if a certain snake's shadow fell on her, she would certainly die. The shadow of a snake did fall on her, and she would in all human probability have died had skilled medical aid not been at hand.

Thana District, Jan. 10. G. W. VIDAL.

THE NEAREST ALLIES OF THE HORSE.

By Veterinary Surgeon J. H. Steel, A.V.D.

(*Read at the Society's Meeting held on 6th February*, 1888.)

In the whole range of Natural History there is no more compact nor isolated group than that of the Equidæ, which, therefore, presents itself as a neat subject for special study. We approach this enquiry with great advantages, in that we are very familiar with

two types of the group, the horse and the ass, in that the geographical distribution of the Equidæ is very marked and limited within certain ranges, and in that the members of the group are so striking and interesting as to have received a good deal of notice from travellers and naturalists. The difficulties in our way are that some confusion has arisen in nomenclature, that observers have not been exact and detailed enough either from a naturalist's or from a horseman's point of view, that many of the Equidæ are very wild and difficult to approach, and, finally, that they are difficult of transport and at first intolerant of confinement in our larger zoological collections. The beautiful work by Cornwallis Harris on the large game of South Africa must be specially mentioned on account of its value to the naturalist and to the sportsman, and because I am indebted to it for some of my illustrations.

Characters—The Equidæ are odd-toed solidungulate animals in which the hoof attains its highest development. Several other anatomical features of their limbs point to their swiftness of foot; for example, the femur has a third trochanter, the two facets on the front of astragulus are very unequal. They are all gramnivorous and have, accordingly, a fairly simple stomach and capacious intestine, together with a special form of dentition not suited to rumination, but with well marked diastemata or breaks in the tooth series. The dorso-lumbar vertebræ are not less than twenty-two in number, and horns are not present as a normal character. Among the order Ungulata, to which the Equidæ belong, the rhinoceroses and tapirs of extant genera and the palæotheridæ and the macrauchenidæ of the past are included with the Equidæ as odd-toed or perissodactyla, the differences between the horses and other odd-toed ungulates are, however, very marked. All Equidæ are gregarious, the units of the herds being family groups of eight to ten, and the size of the full herd being determined by plentifulness of grass and freedom from disturbance. The habitat is country firm under foot and somewhat dry. There is a tendency to migrate in accordance with food supplies to the plains in wet weather and to mountains in dry weather, but in all countries occupied by Equidæ the plains are desert and sandy throughout a considerable part of the year.

It will be observed that in every respect, and even in the minds of naturalists, there is a tendency for the different equine forms to run into one another, whence has resulted much difference of opinion as to *classification of the group*. Species run into species,

varieties are very common in some cases, the characters by which one form is distinguished from another are observed to sink in importance the more thoroughly they are investigated, and it would seem that there is quite as much reason for separating the European man from the Australian savage as there is for placing the zebra and horse in distinct species. Sharply as the Equidæ as a group are defined, it is wonderful how few essential points of difference they present among themselves. Some naturalists refuse to accept the differences as more than specific, and thus describe each form as Equus. Others consider as horses those which have chestnuts and castors, *i. e.*, "warts," on both fore and hind legs, and classify the asses and zebras together as being devoid of castors. The retention of castors, though apparently a very petty matter, seems certainly to have a value in systematic classification. Hamilton Smith goes further and insists on giving the zebras and their allies a distinct generic name, Hippotigris, and, considering their distinct geographical range and apparently long special descent, the South African Equidæ seem worthy of this distinction, which leads us to the following classification:—

EQUIDÆ.

Horses (Equus).	Asses (Asinus).	Zebras (Hippotigris)
1. Equus.	1. Asinus.	1. Zebra.
	2. Onager.	2. Burchell's Zebra.
	3. Hemippus.	3. Quagga.
	4. Tæniopus.	
	5. Hemionus.	

It must be remembered that the early naturalists especially have confused certain of these forms, or, at any rate, their names. Thus hemionus was applied first by Pallas to the kiang, but since then has been used for the onager or for hemippus. A less serious confusion is the use of the term onager for the Assyrian wild ass (*As. hemippus*) instead of for the wild ass of Cutch; but competent naturalists, such as Sclater, doubt whether there really is any difference between the onager and the hemippe, while others consider tæniopus is also simply a variety of onager, Thus the asses would tend to become only three forms, the true ass, onager, and the kiang. Even this reduction is by some considered insufficient, and *Asinus vulgaris* is taken to have direct and immediate relation with the onager, either as progenitor or descendant; some observers specially notifying Tæniopus as the variety most directly related in descent to the common domesticated ass, in support of which view we shall

see that the equines admit of enormous variation under natural and artificial influences. Again, hemionus (the kiang) is sometimes spoken of as the wild horse, and has been confused with the terpan or wild horse of Tartary. Cunningham is responsible for calling it the wild horse, and others agree with him that its voice is more like a neigh than a bray. Some state that the sound it makes is like that of a mule. Moorcroft, Strachey, and others say his cry is most like braying, and the balance of evidence is in favour of his being a true ass, though, as Jerdon points out, his darker colour, small ears, and large size, as compared with the onager, render him, when at a distance, liable to be mistaken for a horse. We have elsewhere observed that the Tartars use the term koulan indifferently for the terpan and the kiang, another element of confusion. On the other hand, as we have seen, naturalists have in different cases applied the term hemionus to the onager and the kiang, and it seems that the Tartars also call onager, the koulan. Jerdon enumerates as follows the differences between the ghorkhur (onager) and the kiang:—

Marks.	Ghorkhur.	Kiang.
Dorsal stripe	Broader on the back, does not extend to tail-tuft, bordered with white, which extends broadly to tail and along hind margin of buttocks.	Broader over tail and extends to tail tuft. [Sometimes very obscure or wanting (Strachey)].
Shoulder stripe	Darker blackish and well marked.	Often only faintly visible. [Sometimes distinct (Strachey)].
Limb marking	Generally present. White of under parts and belly well marked.	Absent.

Blyth in his paper on wild asses (Journal Asiatic Society, 1869, p. 229, *et seq.*) seems to have confused the ghorkhur and the kiang. J. Hooker rightly considered them distinct (Jerdon).

We may now proceed to notice each form in turn:—

(1) EQUUS CABALLUS, the common or domestic horse, Eq. antiquorum.

Mane and tail long and flowing; hairs of tail over whole posterior surface of stump.

Horny appendages—Ergots typically present on all four limbs, chestnuts inside fore arms, castors inside hocks, warts rarely absent on hind legs; "the bay mare, Eaglet, was without sallenders on the hock joint."—(*Jamaica Times*, 1845, Aug. 25.)

Colour—Various, principally bay and dun; occasionally rufous, mouse colour, white, dappled grey, &c.

Markings—Dorsal stripe in some breeds; very occasionally faint traces of shoulder stripes; occasionally zebra marks about knee and hock (especially on outside).

Size—Varies much; from about 9 hands to 17 hands, or average of over 14 hands.

Habits—Gregarious, docile, and domesticable; inquisitive; enormous geographical range; much influenced by domestication.

Voice—A neigh.

Ears—Short and fine.

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2. Asinus vulgaris (Gray): Equus asinus, the common ass; As. domesticus (H. Smith). The lineal descendant of As. tæniopus (Sclater and Darwin).

Mane and tail—Mane short, upright, irregular; tail has tuft at extremity.

Horny appendages—No castors.

Colour—Mouse grey; varies to an extent.

Markings—List or "dorsal stripe," cross shoulder stripe, which varies much in length, breadth, and manner of termination. Sometimes absent, occasionally double or treble: may be forked at its extremity, or bent into an angle as in the quagga and Burchell's zebra. Often zebra marks, especially on the fore limbs.

Size—Varies much from 9 hands to 17 hands.

Habits—Strong, hardy, sure-footed, much warped by domestication. "In South America numerous asses have been allowed to escape into the plains and multiply in a state of nature; but they never acquire the habits of their freeborn progenitors in the desert; they linger near the places of their birth and fall an easy prey to their enemies." (Low.) Only lately known in Sweden and Norway; not found in Burma. Four Syrian varieties (Darwin):—

"(1) A light and graceful animal, with agreeable gait, used by ladies; (2) an Arab breed reserved exclusively for the saddle; (3) a stouter animal used for ploughing and various purposes; (4) the large Damascus breed with peculiarly long body and ears."

Voice—A bray.

Ears—Long and thick.

Head—Forehead arched.

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3. EQUUS ONAGER (Pallas); Asinus onager: As. indicus (Sclater); Eq. hemionus of India (Auct); ghorkur, Asiatic wild ass of Cutch, As. sylvestris (Pliny); As. hemionus (Gray); gour (Persian); Eq. khur (Lesson); mistakenly koulan.

Mane and tail—Tail tuft short; mane blackish brown. Mane hog and scanty.

Horny appendages—Ergot patches of thin horn on all four limbs; chestnuts 3 in. by 2 in., thin horny patches; no castors.

Colour—Pale isabella or sandy above with slight but distinct rufescent tinge (Jerdon). Lower half of muzzle, lower part of neck, along each side of dorsal stripe along back, under belly, back of fore limbs, round the front and outside of the elbows, front of the hind limbs to the hock, and back of the limbs to the hamstring white. (Mare in Jodhpur Collection, 1887.)

Female in Victoria Gardens.—Muzzle and lower parts of body and limbs white; slight zebra marks, both knees; large chestnut horny patches; general colour rufous or isabella; tip of ears and outer side of hind margin brown; mane upright, brown, decreases from poll backwards; dorsal stripe zigzag between withers, very wide to croup, along back and loins, narrowing on tail, and does not run to tuft, but terminates about half way.

Markings—Dorsal stripe chocolate brown: very broad at commencement of croup, grows gradually narrow towards the mane, runs to tail tuft (Mare in Jodhpur Collection, 1887). Colour extends slightly down outside of shoulder; sometimes double cross stripe (Jerdon). Zebra marks on hocks posteriorly in female, zigzag markings from stifle to below hock on outer side of limbs and from outside of elbow to below knee in fore limb in male (Jodhpore Collection). Limbs faintly barred, now and then strongly so; narrow dark ring over hoof (Jerdon). Zebra marks on shoulder in adult and still more in foal (Walker).

Size—11 to 12 hands.

Habits—Shy, difficult to approach; of great speed; lives in troops each under a leader, on the plains in winter and mountains in summer. Bikaneer herd of about 150; foaling in June, July, and August.

Voice—"A shrieking bray" (Blyth), or like that of a mule (Tytler).

Ears—Sandy externally, white internally, with black tip and outer border; longish (Jerdon). Certainly brown at tips in Jodhpur

specimens, rounded at tips, smaller in proportion than those of domesticated ass.

Head—Heavy, but well formed; neck short; croup higher than withers, which are scarcely developed.

Remarks—"Nine-tenths are actually gelt by the teeth of the jealous sire the moment they are foaled" (Harris).* This animal is sometimes captured alive, for sale to chiefs, by means of relays of horses, which run it down. It requires an exceptionally good horse when mounted, to fairly excel the wild ass in pace and endurance. Sometimes he is captured by means of falcons or is shot; the flesh is esteemed a great luxury. The hide is converted into the common Turkish shagreen. The young are sometimes trained, but adults become unruly. The onager is found in Cutch, Guzerat, Jeysalmir, Bikaneer, Sind, Beloochistan, Persia, and Turkestan; its range is to Deesa south, to 75° long. E., and to lat. 48° N. in Turkestan, west it extends as far as the road running from Teheran to Shiraz. I have a suspicion that not so very long ago the onager extended into the Deccan. Specifically identical with As. vulgaris, either progenitor or descendant (Cobbold). [Alayar Khan of Mahmudabad sent out into the desert for a wild ass. One was shot and brought in. It was as big as a small mule, yellow dun with dorsal stripe. . . . Ghorkur was seen in the desert towards Abiverd. The Khoords describe a good horse by saying he can ride down a wild ass. On the Attrek in the broad open vales wild asses (Roostum said) are to be found in immense numbers. Between Sanghos and Jahjerm near the brackish streams about four miles off the road numberless fresh tracks, as though the whole herd had followed in Indian file, were seen. The ground was very rough and broken, though quite rideable, rather heavy going, being covered with a salt sandy crust through which the horse's feet sank at each stride * * * Came suddenly on a herd of fourteen. The horses (after a march) were done up in trying to chase them down (Col. Valentine Baker)].

4. EQUUS HEMIPPUS (Is. Geof. St. Hilaire); As. indicus Sclater); Hemippe: Syrian wild ass; wild ass of Scripture.

Voice—More like a bray than that of onager (Blyth). St. Hilaire also notices this difference.

* This is, of course, a "traveller's yarn."—J. H. S.

Ears—Shorter than onager (Blyth).

Head—Smaller than onager (Blyth).

Remarks—Found in Syria, Mesopotamia, and North Africa.

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5. EQUUS TÆNIOPUS (Hengl.) As. tæniopus; Abyssinian wild ass.

Characters—As of Eq. onager; stripes frequent on hind legs.

Habitat—Abyssinia and the desert plains between the Nile and the Red Sea.

Horny appendages—Hoofs as broad as those of a horse of fifteen hands in height (Baker); remarkably large, wide, and firm.

Colour—A reddish cream tinged with the shade most prevalent of the ground it inhabits (Sir S. Baker).

Markings—Cross bands on legs and shoulder stripes.

Size—13·3 to 14 hands, of a fine male (Baker).

Rayment shows that a small breed of donkeys in Muscat is remarkable for hardihood, endurance, and viciousness, qualities to an extent due to constant crossing with the wild stallion from the Assyrian desert captured for the purpose (probably the hemippe).

Remarks—Supposed to be the nearest feral representative of the domestic ass. "The perfection of activity and courage, and has a high-bred tone in the deportment, a high actioned step when it trots freely over the rocks and sand, with the speed of the horse when it gallops over the boundless desert." (Baker.)

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6. EQUUS HEMIONUS (Pallas): Kiang; Tschiketai; Thibetan wild ass; kulan; the wild horse (Cunningham); djang (Tangutans).

Mane and tail—Mane dun (Moorcroft).

Colour—Upper parts dull ruddy brown or chestnut rufous hue approaching bay, especially about the head; distinctly darker at the flanks, where it abruptly contrasts with the white on the belly. Coat varies according to season, smooth and rufous in warm weather; legs a pale straw. Darker in colour than onager.

Markings—Dorsal stripe black; absent, obscure or well developed, extending to tail tuft, broad on croup. No zebra stripes either in adult or foal (Walker). Shoulder stripe sometimes distinct, often but faint or rudimentary; generally absent.

Size—Fourteen hands.

Habits—Wary, swift, difficult to approach, inquisitive, lives in small troops or herds in Thibet and Central Asia. Moorcroft saw

it in Ladak, and his pundit, Izzat Ullah, mentions wild asses in Khoten; extends into China eastward. Lives on plateaux at elevation of 15,000 to 16,000 feet above sea level. Fly at a trot, stop, look back. Prejevalsky considers it the most remarkable animal of the Kokonor Steppes. It is found also in Tsaidam and North Thibet. Often seen grazing in company with mountain sheep. Found in troops ten to fifty strong, or in herds of several hundreds, in Kokonor (Prejevalsky). The young are born in May, but many die before maturity (Prejevalsky).

Voice--Has given rise to much discussion as to whether he neighs or brays. Prejevalsky heard his voice twice, once when a stallion was calling back mares, the second time when two were fighting. It is "a loud harsh neigh, repeated at short intervals, combined with a bray."

Ears—Moderate in length.

Head—Large and ugly; forehead convex between eyes; centre of face narrow and keeled on sides.

Remarks—In size and external appearance closely resembles a mule (Prejevalsky). Is the most equine of wild asses, and differs but little from the Terpan or wild horse of Central Asia, for which it is constantly mistaken. Is also, especially by the Tartars, confused with onager, both being called kulan. Gray discusses the position of the infra-orbital foramen in the kiang and onager, also certain differences in the skulls. I am inclined to consider these differences as simply due to age not to specific influences. A comparative study of the skulls (and indeed of the skeletons in general) of the Equidæ is much needed. When young they will become so tame as to be led about like a horse, and will follow horses almost everywhere (Charlton). Colonel Smith describes as the Yo-to-tze also as As. equuleus *vel* Hippargus, an animal seen alive in a livery stable near Park Lane, London, said to have been brought from the Chinese frontier N.-E. of Calcutta. It had shoulder bands black, three or four cross streaks (black) on knees and hocks; well defined black dorsal stripe to centre of tail; tip of ears, mane, and long hairs of tail black. Gray thinks it may have been a cross between the kiang and the domestic ass. The natives consider kiang flesh a great delicacy and stalk the animals to shoot them after drinking. They are very plucky when hit and hard to bring down. They get very fat in autumn; when frightened they run *down* the wind.

7. Equus quagga (Linnæus): As. quagga; "Female zebra" (Edwardes); Hippotigris quagga (H. Smith); Hipp. isabellinus (H. Smith); Ane isabelle (Le Vaillant). The quagga is the bravest of equines, and so was occasionally domesticated by the Boers to be turned out with the horses at night to protect the latter from predatory beasts on which the quagga springs, beats them to the ground with forehoofs, and tramples them to death (Nott).

Mane and tail—Hair extends nearer to base of tail than in other equines, except horses (Lesson). Hog mane, banded alternately brown and white; tail white.

Horny appendages—No castors—hoofs slightly concave beneath and broader than in zebra. "A foot which might serve as a model to a veterinary student" (Harris).

Colour—Upper parts of hide rufous brown; lower parts of body white; legs white; stripes on forehead and temples longitudinal, and on cheeks with narrow transversal stripes forming lineal triangular figures between eyes and mouth.

Markings—Stripes to centre of shoulder and back; stripes not so deep in colour as those of zebra. Muzzle black. Dorsal line dark and broad, widening over croup.

Size—13 to 13·2 hands, about 6 inches longer than that of true zebra (Nott): (8ft. 6in. long).

Habits—Courageous, sociable, peaceable, found in immense herds in the open plains, travels in long files of many hundreds, parallel with caravans (Harris). Is not seen north of the Vaal, and is vanishing before civilization. Seems remarkably fond of the brindled gnu and ostrich, which graze with it, but does not mix with its own more elegant congeners (Harris). Form compact, body round, limbs robust, clean, and sinewy, with pace low and laboured.

Voice—Like the bark of a dog, a shrill barking neigh, which its name well imitates.

Ears—Equine. Flesh disgustingly oily and yellow.

Head and neck—Very large, which increases the apparent size of the animal.

Remarks—Buckley considers that now the Burchell's zebra is generally called the quagga, and Harris' quagga must have become extinct. The zebras of all three kinds have been shot extensively, because their hide forms good connecting bands for machinery. Less fierce in disposition than the zebras and "of the whole family

unquestionably the species that is best calculated for domestication" (Nott).

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8. Equus Burchellii (Bennett); Hippotigris Burchellii (Smith); As. Burchellii (Gray); Eq. zebroides (Lesson); Eq. montanus (?) (Cuvier): Bonti Quagga (Cape Colonist): Dauw; Peechey or Peet-sey (of Bechuanas): "Is the Quagga *par excellence* of South African sportsmen" (Nott).

Mane and tail—Tail white, equine; mane hog, banded black and white; mane 5 in. high.

Horny appendages—Hoof soles slightly concave, rather broad.

Colour and markings—Muzzle black; head and upper parts of body and upper part of legs sienna-brown, and with broad dark brown bands not uniting above with dorsal line, which widens towards the croup. Lower parts of body and of limbs and inside of limbs white; bands less numerous than those of zebra. The degree and extent of colouring varies much (Buckley).

Size—13½ hands. 8ft. 6in. from nose to point of tail (Harris).

Habits—Seems very fond of the brindled gnu; found in herds of 80 to 100 (Harris). Buckley generally saw it, at least in the bush, in parties of 8 to 10, his largest troop being about 40. Found on the plains north of the Orange River, but migrates periodically in accordance with exigencies of food supply. Extends into Abyssinia and Congo. Is fierce, strong, fleet, and beautiful (Harris.) Stout in build, admits of being tamed to a certain extent with considerable facility, and occasionally a half domesticated specimen is exposed for sale in Cape Town with a rider on its back, but even in the most tractable state to which it has yet been reduced it is regarded as wicked, treacherous, obstinate, and fickle (H. Smith). The late Lord Derby had several in his collection at Knowsley Park, and was very successful in rearing foals (Nott). Figure sturdy and graceful; carcase round; limbs clean and muscular, less robust than those of the quagga.

Voice—A shrill abrupt neigh, which may be likened to the barking of a dog, as heard by a passer-by from the interior of a house (Harris).

Ears—Equine.

Remarks—Has four mammæ. Skin extremely valuable; flesh much appreciated by natives, but its dark colour and yellow fat render it anything but tempting to most white men (Nott).

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9. EQUUS ZEBRA (Linnæus); Wilde-paarde (Dutch Colonists); Hippotigris zebra *v.* campestris (Smith); Asinus zebra (Gray); Equus montanus (Burchellii); Daw (or true zebra) of the Colonists; Hipp. antiquorum (H. Smith). Louis Figuier states that the Persians used to slaughter zebras (probably onagers) at their religious festivals, and kept a stock of them for the purpose on a small island in the Red Sea.

Mane and tail – End of tail a black tuft; remainder of tail white. Mane bushy, hog, and banded.

Horny appendages—Hoofs narrow, with hollow soles; no castors.

Colour—Creamy white, inside of legs and belly white; muzzle reddish or tan.

Markings—Striped of black colour over the body, head, and limbs, the bands being narrow or wide, black, and sinuous, and uniting with the longitudinal dorsal line. Those of body nearly vertical, those of limbs horizontal and closer together than those on the body.

Size—Under thirteen hands, exceeds eight feet in extreme length.

Habitat—Inhabits the hilly region of South Africa. Harris gives his range from Abyssinia to the Cape. The Dutch farmers used to catch foals and export them "chiefly to Mauritius, where it is said they were often whimsically trained to harness." A Queen of Portugal used to drive a team of zebras, and Rarey tamed one. Upwards of 100 in a troop; is shy, fierce, obstinate, nearly untameable, timid, supposed to be rapidly becoming extinct.

Voice—Subdued neighs like the gasps of a dying man (Anderson).

Ears—Long and widely opened.

Head—Light.

Remarks—Flesh coarse, oily, unpalatable; two mammæ. There is a small amount of written testimony to the occurrence of zebras or onagers in the mountains of Spain between the 10th and 13th centuries, probably imports from West Africa. They were widely dispersed from Galicia to Estremadura and Andalusia.

We are now in a position to enter more into detail with regard to the general characters of the Equidæ. We find that all present a *mane* or growth of long hair at the upper margin of the neck, which varies in length, colour, and arrangement. It is most highly de-

veloped in the male, and it is decidedly ornamental, whether as the long flowing manelocks of the horse or the smart hogged appendage seen in the other forms. It may be uniform in colour, is generally darker than the rest of the body, or banded in accordance with the striped condition of the neck; the bands may be black or brown; long hairs also grow on the *tail*, rendering it a beautiful appendage and useful fly-flapper. Here also the horse has the advantage, the hair being long and flowing, covering the whole of the tip and outer part of the stump. Burchell's zebra and the quagga have the equine form of tail, but the capillary arrangement is less striking. The other equines resemble the ass, in that the long hairs are developed on the end of the stump as a tail tuft resembling that seen in some ruminants. In the zebra the tip of the tail is black and the rest white. As a rule, the organ is darker in colour than the rest of the body.

Of *horny appendages*, the *hoofs* vary in broadness and concavity of sole, a point which seems to be much determined by, and to indicate, the habit of the animal. Thus mountainous and sure-footed equines have mule feet, *i.e.*, hoofs upright, narrow, and hollow-soled, as seen in the ass and zebra. *Castors* are absent in all forms except caballus, but we have no distinct evidence as to whether they are present or absent in the kiang: it seems they are sometimes not found in true horses. On the other hand, the *chestnuts* and *ergots* seem present in all species; in the horse they are hard and strong, in the onager they are wide and soft horny patches. Ergots may be absent, certainly in high-bred horses.

The *colour* varies from black to white, no rule can be given except that the wild forms tend to sandy or rufous tint with lighter shades of the lower parts of the body and insides of the limbs, also darker "points," *i.e.*, muzzle, mane, tail, and legs. Domestication tends to great variety in colour.

Markings attain their hightest development in the zebra as (*a*) dorsal line from mane to tail of dark colour (black or brown); (*b*) vertical body lines, of which the most persistent are those on the centre of the shoulders, which are wide and forked at their free ends, others are parallel with the branches of the forks; and (*c*) the horizontal bands of the limbs. These markings reappear more or less in all forms, the most frequent and constant being the dorsal stripe or list, found as a characteristic even in some breeds of horses. Not much less frequent are shoulder stripes, and even the zebra

marks on knees and hocks reappear frequently in horses. Darwin considers that if grey or red brown asses had been steadily selected and bred from, the shoulder stripe would have been as generally and completely lost as in the horse. These markings are best seen in the male; often when present in the young they disappear in adults.

Size shows a neat gradation from the wretched little 7-hand donkey of the Maharattas up to the 16-hand dray horse; it varies enormously with domestication, but among the equines in the wild state seems to range from 11 hands or 12 hands (onager and zebra) through 13 hands (quagga), and 13½ hands (peechey) to 14 hands in the kiang, and still more in the wild horse.

Habits—All these wild equines are strong, hardy, swift-footed, courageous, but shy, and curious in the extreme. They vary much in tameability, but have all been more or less brought under control, and they exhibit as much variety in character as we see in domestic horses. The liking of these animals for, and their ready association with, other species is remarkable. All seem to be fond of the gnu, and they do not object to the presence among them of so different a creature as the ostrich. The gregarious instinct seems stronger in some forms, such as the zebra, than in others like the kiang, but the size of the troops is probably determined much by the amount of pasture available and the freedom from disturbance by man. The same influences determine the range, both African and Asiatic forms are retreating before the advancing steps of civilization, and they all seem to frequent the mountains in hot weather and the plains in cold, according to the amount of pasturage available. The kiang and zebra are most fond of mountains, the onager inhabits hills and sandy deserts, and the peechey grassy plains. These differences seem to be determined by local circumstances: in fact, the equine adapts himself to the conditions of his surroundings.

The *voice* ranges from a neigh, so familiar in the horse, to a bray, equally familiar in the ass. The intervening sounds seem to vary as much as the tuneful notes of transport mules when the trumpet sounds "feed."

The *ears* vary much in relative development as regards length, sharpness of tip, and fineness, exhibiting every gradation between the familiar auricle of the ass and the neat delicate corresponding part in the horse.

Our information as to osteological characters is very scanty, but it suffices to show us that the differences are simply those of

measurement, *i.e.*, such as we look for in comparing the skeleton of a man of one race with that of another.

As regards *shape* there is a general tendency to largeness of the muzzle, backward setting of the eyes, shortness in the rein, and imperfect setting on of the head. Neck short and stout, shoulder upright, forearms and thighs moderate in length, limbs small below the knee and hock, back short, barrel rounded and large, quarters rounded, tail set on low, goose-rump. These general characters are not those best adapted to man's requirements from horses, but they are suited to enable the unbridled and unmounted equine to be swift in the extreme, sure-footed, and capable of remarkable endurance. It is not only in respect to less suitability for man's requirements than the horse of civilization that inferences from the study of the asses and zebras agree with those which, as on a previous occasion we have seen, may be drawn from a study of wild horses. The remarks made about wild horses, as regards uses, methods of capture, geological range in time, also the physical characters of the habitat may be extended tc the true feral Equidæ.

Traits of temper, character, inclinations, and habits are remarkably uniform in animals of the horse tribe. In the study of the ass we might almost go over the same ground as that already traversed in investigation of the horse; the uncertainty of origin, the considerable range of variation, some remarkable limits in geographical range under natural influences, and extension of spread under human influences, might be commented on. Writers on natural history lay stress on the fact that the ass never really goes wild as the horse is apt to do, and the zebras never really become domesticated; but I doubt whether the former view could be thoroughly established, and I have already had occasion to direct attention to th efact that the fierceness and untameability of the zebras is somewhat overrated.

Previously we have drawn from such evidence as was to hand in the form of geological remains, early art, testimony afforded by horses in the present day, and otherwise, a sketch of what we considered to be the primitive horse, and concluded that he must have been remarkably like the wild asses and zebras of the present day. One cannot help going still further backwards in time, and surmising that there was a period when the equines of the world were only of one kind, the ancestor of the horses, asses, and zebras of to-day. Supposing this to have been the

case, we may surmise that the ancestor in question was a sort of dun brown in colour with hog mane, dorsal stripe, and probably asinine tail. The lower part of his body and the inner sides of his limbs were lighter in colour than the general ground of the skin, he probably had zebra marks and castors; was rather small in size (say 12 hands), had large head and ears, stout and rather short limbs, narrowish mule feet. His habits were those of the wild equines in the present day, but his range was much more extensive, comprising Europe, Asia, Africa, and America. In time he became extinct in America after undergoing development in several directions probably; in Central Asia he developed caballine characters such as are seen in the kiang and terpan, and, as they proved useful to man, were the cause of subjection of this branch of the family to man and its enormous modification by art. In Arabia and South-East Asia the asinine characters found favourable influences, and some of them, as seen in the tæniope and onager, also proved useful to man, who brought artificial selection to bear in such a way that the domesticated ass of the present day differs remarkably from the onager. Finally, in East Africa to the extreme south, the hippotigrine characteristics seem to have found scope for development. Man found this branch uncontrollable, and it probably affords us an example of the least changed descendant of equus primigenius. It is generally now admitted that the theory of descent can be accepted as a good working hypothesis. It certainly receives support from study of the Equidæ and, on the other hand, would lead us to interesting conclusions with regard to them. It would explain to us where the stripes of the zebra come from, and why in South Africa the equines differ in appearance from those of Asia and North Africa. Taking it into consideration, we can to an extent understand that the inborn tendency of the horses of all kinds to develop donkey stripes and zebra marks, a tendency most often manifested in the foal of non-striped races which in the South African forms, becomes exaggerated, so that we are led through the quagga and Burchell's zebra to the true zebras, which exhibit striation to the full extent. The theory of descent as regards zebras is much more satisfactory than that of mimicry. We must consider it much more probable that equines spread to South Africa and gradually become modified by surroundings than that in the South African fauna there were developed animals showing full equine characters but differing from the horses and asses in being

more striped. Geological and historical evidences are in favour of the former view, and we find transitional specimens between the different kinds of zebra, which lead to the belief that change is still going on in the present day. It is interesting to note how the quagga inclines to equine characters and the other two forms somewhat to those of the wild asses of Cutch and Thibet. This would seem to indicate a tendency of the zebras to branch off into new forms, as the original stock did, exhibiting equine, asinine, and zebraic characters.

To conclude: Study of the feral equines enables us to determine what are the essential characters of the group and to contrast them with those found in the horse and the common ass warped by domestication. It teaches us what are the natural conditions of the horse, from which we may draw useful lessons as to preservation of his health. It places us in a position to appreciate the enormous influence exerted by man on the horse and ass. Some valuable general conclusions on artificial and natural selection, on geographical and geological range, and on other important problems of natural history can be derived from the study; and, finally, to the sportsman and even to the student of economy our subject should prove interesting and instructive. To the zealous student the group of Equidæ presents many problems to be solved and much error and mawkish sentiment to be estimated at its true value in the search for *truth*.

THE CONDITIONS FOR THE DISTRIBUTION OF PLANTS AND THE MEANS BY WHICH IT IS PERFORMED, WITH SPECIAL REGARD TO INDIAN SPECIES.

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Though it would be very tempting to give you a demonstration of the vast number of picturesque features that are caused by the natural association of plants, or to point out for you the striking peculiarities of vegetation in various climates and regions, or, in short, to describe the multifarious aspects of geographical distribution of plants, I shall resist the temptation, and confine my remarks to some of the causes on which local floræ depend.

The more important of these causes are—the conditions for the distribution of plants and the means of distribution. (Besides these, a very important item is the comparative power of plants of holding their own in the struggle for existence, a subject which still requires the most careful study, and which I am not prepared to deal with here.) The conditions for distribution of plants are chiefly these, *viz.*, the climate, the adaptation of plants for climatic influences, the natural quality of the soil, and the necessity of fertilisation for plants. You are all aware of the very distinct features of vegetation, as represented in different regions, countries, or even localities of the same province. You will have noticed that the vegetation of the seashore is very different from that represented further inland; that the plants of our hills are to a great extent of other species than those occurring in the plains, or that almost every different locality has its peculiar flora. When we ask for the reason of this, the reply will often be found in the various natural conditions of the said locality, but what I especially wish to point out to you is, that a little closer observation of the plants themselves will prove that peculiarities in their structure or apparently casual appendages make them particularly adapted for the natural conditions presented by the locality, and that they are of the utmost importance with regard to distribution of the plants. For the observation of this fact, as for so many important discoveries in regard to natural objects, we are specially indebted to your great countryman, Charles Darwin, who pointed out the way, which has been followed by several botanists, among whom I may mention Dr. Hermann Müller (Lippstadt), Dr. Friedrich Hildebrand (Leipsic), Dr. A. Kerner (Vienna), and Professor Otto Kunze (Leipsic), as authorities for many of the views expressed in my paper. The field is, however, so vast, that the subject will probably never be thoroughly exhausted. It is particularly interesting, not only in affording ample evidence in support of the much disputed theories of Darwin, but also in explaining the necessity of almost every organ of plant life. Of the natural conditions for distribution of plants none is more decisive than the climate. The local range of temperature is in many instances an absolute necessity for the growth of plants, and by this circumstance the limits of distribution for every species of plants are generally fixed. As to the exact range of temperature necessary for the individual species, the requirements greatly differ, but it may be regarded as certain, that

for every species there is a maximum and minimum of heat, which the plant will endure without harm, while an excess will kill the plant or at least prevent its distribution. It is a well-known fact that the faintest touch of frost is sure to destroy a *Dahlia* or a *Heliotrope*, while *Chrysanthemums*, *Pansies* and *Daisies* continue to flower even in several degrees of frost, also that many seeds of plants from colder climates, as of most European weeds, do not even germinate in a tropical climate, and that many annuals only grow satisfactorily here in the cold season. On the other hand, most Indian plants, when cultivated in Europe, require a certain amount of artificial heat. Some very interesting experiments and observations have been made with the grape-vine, I believe, by a German botanist, who has succeeded in proving that this plant everywhere and under different natural conditions, requires the same total amount of degrees of heat for performing its growth and producing good fruit, and it may be regarded as certain that the same total amount of sunlight is necessary to produce the full chemical qualities of the grape, as colour, flavour, and sweetness.

The limits of distribution for plants of the same species with regard to influence of temperature are sometimes very extensive. The *rose*, for instance, grows to perfection as far north as Sweden up to 60°, N.L., though there certainly requiring protection in winter, and is at the same time satisfactorily cultivated here in Bombay. This fact may, however, partly be attributed to cultivation and to properties thereby acquired. But even among wild plants, several species with an equally large range of distribution, occur, as *Solanum nigrum*, which is a very troublesome weed all over Europe, and not uncommon here in India, though perhaps originally introduced. Other plants have but a very limited range of distribution, as the Mangosteen, *Garcinia mangostana*, which is truly wild in the Malay Peninsula, but even in Bombay, not 20° farther North, is a very tender plant, though the same genus is represented by other species as *Garcinia indica*, the kokum, and *Garcinia xanthochymus*, which both yield pleasant acid fruits.

A similar demonstration of these facts is pointed out in the Hon'ble Mr. Justice Birdwood's excellent Catalogue of the Flora of Matheran and Mahableshwar, by comparing the vegetation of the ascents with that of the top of the hills, and which I need not further explain.

By close observation of the plants of the same species or genus, we shall find that they greatly vary even within the same range of

temperature according to locality, and that this variation is chiefly due to adaptations for excesses of temperature or to more or less developed means of protection against climatic influences. Here we never experience any *severe cold*, and I need not dwell upon the means by which plants are protected against the injurious effects of a low temperature, but shall only mention that these are often similar to those intended for protection against heat; in many cases, however, the medium of protection is the snow, which fact explains the tenderness of many Alpine plants, when cultivated in temperate regions. The heat of our climate is at times very trying, not only for man but also for plants, and most of our plants are therefore provided with means of protection against the heat and aridity of the long dry season. The Indian tropical flora is in comparison to that of more temperate climates singularly rich in arboreous species, a fact that may be accounted for by the greater resistance of a woody structure to excesses of heat. I cannot here deal with the structure of the wood and the stem of a plant, but must restrict my remarks to point out that it is especially adapted to protect the plants against climatic exigencies, and that in this respect perhaps the *cork*, the *liber* or bast, and *the bark* are very important parts of the wood. It is therefore not surprising to find that both *cork* and *liber* are frequently very conspicuous in Indian trees. I have in fact only seen very few where the cork is not clearly visible, if not otherwise, then by lenticels on the young shoots, especially when these are glabrous. It is also a well known fact that many Indian trees are rich in fibre, which is generally the produce of a well developed liber.

The next object for observation is *the pubescence or hairiness of plants*, which though apparently insignificant, is of the utmost importance for protecting plants. As far as I have been able to judge from observation of plants that have as yet come under my notice, I think it is a fact that most herbaceous plants, when completing their growth during the rains, are more or less glabrous; while those species, which continue their growth during the dry season, are generally more or less hairy. You will notice this by observing the weeds of this season. As an example, I shall mention a few of the numerous species of the genus *Blumea*, which is singularly interesting also in other respects. The most common species, *Blumea membranacea muralis*, which grows on old walls and on the inside of wells, has almost completed its growth when the dry

season sets in, is quite glabrous below, only glandular-pubescent on the upper parts, and quite scentless. The common *Blumea Wightiana* is distinguished by its dense, almost velvety pubescence, and a most pleasant mint-like fragrance; it grows with its near ally, *Blumea* (now *Laggera*) *aurita* on rubbish-heaps, and as a weed of the cold season in gardens and fields. The last-mentioned species is perhaps less hairy, but has a much stronger turpentine-like fragrance, as also the yellow flowered *Blumea laccra*, common on roadsides. Finally, we have the mountain forms, *Blumea glamerata and Blumea Malcolmi*, both of which are densely woolly, silvery white and strongly scented.

But also within the same species the degree of pubescence is very variable according to season of growth and locality. One of our most common weeds, *Gynandropsis pentaphylla*, is generally nearly smooth in the rains, but at this time of the year always more or less hairy, and *Hydrocotyle rotundifolia* is glabrous in shady positions, but hairy when exposed to the sun.

Similar observations with regard to other plants have led to a correct conception of the importance of hairs for plants. The protection they afford is manifold, chiefly against excessive heat; and I shall only mention a few of the more important capacities of the hairs. When closely set they shade the tender parts of plants against the burning rays of the sun, when very dense and white they reflect the heat; by force of capillarity they always absorb even the smallest quantity of moisture from the air, and finally they serve the plants by retaining the dew.

In citing the various species of *Blumea*, I laid stress on their *fragrance*. I did so, as this peculiarity is also highly protective against heat. You may all have experienced the cooling and refreshing effects of applying perfume to the skin, a circumstance, which I need hardly tell you is caused by the rapid evaporation of all essential oils. Now the fragrance of plants is due to exactly the same cause, evaporation of essential oils, and we may therefore conclude that such plants are constantly cooled and refreshed, in order better to resist the heat. But besides, Chemistry teaches us that the result of this mechanical action is the formation of resinous substances, which are probably deposited on the surface of plants and thus further check the evaporation, chiefly during the hottest and driest parts of the day. The viscidity of many aromatic plants tends to prove this view.

Most Indian trees and shrubs have a glossy green foliage, *e.g.*, the leaves are coriaceous or have a strong *cuticula* (the outer coat of the epidermis). The protection of the mesophyll, or the inner parts of the leaves, is not only due to the close texture of the cuticula, but also to its glossy nature, by which quality the rays of light and heat are reflected. Trees and shrubs with tender foliage as a rule shed their leaves in the dry season, unless these are hairy or protected by other means. Among these I shall mention the periodical movements of leaves, especially the regular folding up of the leaves at nightfall, as we meet with in many *Acacia, Mimosa, Albizzia, Pithecolobium,* and which is frequently called the sleep of plants.* This peculiar phenomenon is probably a very necessary provision which, though caused by the absence of light, is actually intended for exposing the underside of the leaflets to the full benefit of absorbing moisture during the night. Such leaves have as a rule channelled petioles, which are probably meant for retaining the dew.

The leaves of other plants, as of the curious forms of *Cactaceous* plants and leafless *Euphorbias,* are frequently transformed into spines or scales as in *Opuntia Dilleni* and *Euphorbia Tirucalli,* in order to reduce their evaporation and to enable the plants to withstand heat and drought. All *succulent* plants, of which the common *Aloe,* so frequently seen suspended in front of shops in the bazaar, is a good example, are similarly well adapted to flourish in the driest localities.

Tubers, bulbs or *rhizomes,* which in India are represented by numerous species of *Araceæ, Zingiberaceæ, Amaryllideæ, Ferns,* &c., are other structures that preserve the plants during the dry season, when their annual top dies away. The *pseudo-bulbs, fleshy stems* and *quasi-parasitic roots* of *Orchids* are similar contrivances.

Finally *the milky juice of plants,* so characteristic in the genus *Euphorbia,* in many *Ficus,* and several *Asclepiads,* the *secretions of wax* or other vegetable fats, and *the resinous substances* found on many plants, may also be regarded as protection against heat, but more probably as an adaptation for sudden changes of temperature.

Next to severe cold, excessive heat and drought, the *wind* is the most active of climatic agencies. Though in many respects very

* Since I wrote this, I have observed that the leaves of *Cassia marginata* expose their upper surfaces during the night, but in this case the under side is very hairy.

destructive to vegetation, the wind is nevertheless a most necessary assistant for the distribution of plants, which I shall presently show. The fatal effect of strong winds or of constant monsoon winds is well illustrated in Bombay, and the trees at Malabar-Point form one of the most interesting sights of this city. We see there how the Nandruk-trees only grow to a few feet above the ground, and then are forced to continue their growth in a horizontal direction, or how the trunk of a common date-palm in the struggle for existence has assumed a shape which may be almost compared to that of a winding serpent. It is a well known fact that the more exposed points of elevated plateaus or mountains are frequently destitute of trees, or that the species found in such localities by their peculiar structure are singularly adapted to resist the force of the wind, while ravines and other sheltered places are often conspicuous by the richness of their vegetation. It is also a common experience, that many of the beautiful Indian trees will not grow when exposed to the full force of the monsoon, though this fact is not always due to the force of the wind only, but more frequently to the numerous particles of salt that are brought from the sea by the wind On the other hand, most palms, as the *Cocoanut palm* and common *Date palm*, abound and flourish in the immediate neighbourhood of the sea. It has even been said that the sea breeze is absolutely necessary for many palms. This statement is however amply contradicted by the successful culture of most palms in European hot-houses; the truth is probably that dry land winds prove dangerous to their growth.

The means by which trees are protected against the fatal effects of wind, which often seriously affect their distribution, are either sheltered localities or peculiar structures of the root, stem, or crown of the tree. Of sheltered localities I have already mentioned ravines, and may further add dense forests and sheltered plains, but occasionally plants of the same species associate in large clumps, and thereby mutually protect each other. Among the structures of trees, with regard to protection, may be mentioned *deep growing tapering roots*, a frequent occurrence in arboreous plants; a *solid* or *flexible trunk*, as we find in most palms, to which is sometimes added a tendency to grow against the wind, as in the Cocoanut palm; peculiar swelling of the stem, as in the West Indian *Oreodoxa regia*; or a continual *layer of woody leaf scars*, as in *Phœnix sylvestris*, the common date palm. Other trees have a very large and densely-leaved crown, as

the *wild mango*, or are strengthened by rooting pillars or secondary stems, formed by aërial roots, as the *Banyan*, *Pandanus* and *Rhizophora*. By all these structures the individual strength of the tree is enhanced and its resisting power increased, while other trees are so constructed as to reduce the extent of the resisting surface. In a few Indian trees, as in *Eriodendron anfractuosum*, one of our silk-cotton trees, and in *Terminâlia catappa*, the "Badam," all the branches are horizontally arranged in regular whorls, between which there is ample room for the wind to pass. Similar structures are found in a great many *Coniferæ*, noticeably in *Araucarias*, where also the small linear or scaly leaves tend to expose a very small surface to the action of the wind. Such a limited development of the leaves is a common feature in many plants, as in most Australian Leguminous plants, in *Casuarinas*, *Tamarix* and many others. Very finely divided, pinnate or bipinnate leaves, as in *Poinciana*, *Mimosa*, *Albizzia*, *&c.*, do perhaps render similar services to the plants, which seems to be the more necessary as the wood of such trees is frequently very brittle.

The next and last of climatic agencies of which I shall speak are rain, humidity and moisture. Of these the local annual rainfall is chiefly important for distribution of plants, in fixing certain limits, but also humidity of the atmosphere and moisture of the ground are important items. A certain quantity of each of these is necessary for all plants; but it is and will always be extremely difficult to ascertain the exact requirements of the different species, and we can only by experience learn that one requires next to no supply of water or damp air, while another requires to be constantly soaked. How plants are protected against a minimum of rain or moisture has been mentioned in connection with their protection against heat, and it only remains to be seen how they are guarded against excesses. In this respect may be mentioned local shelter, woody structure, *bark*, *cuticula* of the leaves, *secretions of wax* and fatty substances and a layer of condensed air, that frequently surrounds the leaves of many plants and prevents their wetting, as in the fronds of Maidenhair-ferns, which when dipped in water look as if they were silvered and remain perfectly dry. The parts of plants most susceptible to the effects of rain and moisture are the flowers or at least the sexual organs, which are in most cases more or less protected. Their means of protection are however too numerous to be recorded here, and I shall only mention a very few, as the frequent nodding position of the flower, the closing of the petals at night

and in rainy weather, and the season of flowering. Other means are at the same time intended for protection against the attacks of animals, birds and insects, or serve as adaptations for attracting and aiding insects in performing fertilisation, &c., a subject on which several books have been written, and which is far too comprehensive to be more than hinted at here.

In connection with this, I may mention that plants are by numerous means protected against the attacks of animals, birds and insects; but these being of lesser importance for the distribution of plants, may be omitted here.

By a closer observation of the facts of which I have pointed out a few of the most striking, I think we will arrive at the following conclusion :—"That the distribution of plants greatly depends upon their capability of adapting themselves to a particular climate, upon their means of protection, and upon their adoption of new habits under altered circumstances."

The next condition for the distribution of plants is the natural quality of the soil, which is in a few cases of importance. I beg you to remark, that I say a few cases, because the popular conception, or rather deception, is that the quality of the soil is almost everything for the successful growth of plants. With regard to a few plants possessing a particular quality of extracting prepared food from the ground, it is no doubt true, but the rule is that only the physical condition and not the chemical composition of the soil is of importance, as it has been amply proved that plants derive by far the greatest amount of nourishment from the air, and that the few mineral substances that are actually necessary for the growth of plants are nearly always present in sufficient quantities in any kind of soil. We may therefore conclude that the quality of the soil is very insignificant with regard to the distribution of plants, and when at all of importance, may be partly attributed to climatic agencies.

It is however not sufficient that climate and soil offer favourable conditions for the growth of plants; their distribution will also depend upon the perfect development of their flowers and fruits; or upon a satisfactorily performed *fertilisation*, unless the plants possess other means of distribution than seeds. Fertilisation is not always the result of a favourable climate, but is frequently caused by the presence of a particular insect or plant. It is well known that the *Vanilla* grows luxuriantly and flowers freely in India, but also that it never seeds, except when artificially fertilised, a fact

which is due to the absence of a particular insect which abounds in the native country of the Vanilla. A still more interesting example is afforded by the rust of the wheat, caused by a species of fungus, *Puccinia graminis*, which in order to survive must germinate on the leaves of the Barberry, where the fertilisation is performed. This fact was first observed by the late Danish Professor Oersted, and has been practically corroborated by the good results of almost eradicating the common Barberry in Denmark, where it was formerly very frequent. Similar mutual relations between plants are common among several other species of fungus. The most important assistants to fertilisation are wind, dew and insects, and rarely water.

Having now mentioned the most important conditions for the distribution of plants, I shall proceed to deal with the means by which it is performed.

The most natural way of propagation of plants is by seeds, and the different agents that assist in spreading or distributing these are *wind, water, animals, birds, insects,* and *plants* themselves.

The most active of these agents is the *wind,* and very frequently fruits and seeds are specially fitted to derive the full advantage of its action. As examples I shall mention the *feathery tailed fruits* of "Traveller's joy," of which at least one species, *Clematis Gouriana,* is common in our jungles; in this case the elongated styles serve as appliances for flight; or the *pappus* of most of the common *Compositæ*; beautiful, feathery, in the now common, but originally introduced *Tridax procumbens,* or hairy in *Blumeas, Vernonia cinerea, Emilia sonchifolia* and many other common weeds. Here the calyx or the outer perianth of the florets is adapted for flight. Hairy appendages of other kinds, *comas,* are frequent on seeds of several Asclepiads, as *Calotropis gigantea, Asclepias curassavica, Cryptostegia grandiflora,* and in many Apocyneæ as *Anodendron paniculatum,* Dr. Macdonald's seed-traveller, &c., and in a great many other plants. The hairy appendages of seeds in the cotton-plants, *Gossypium,* in silk cotton trees, *Eriodendron anfractuosum* and *Bombax malabaricum* serve a double purpose, *e. g.*, as appliances for flight and as a means of adhesion to the skin of animals. Other appliances for flight are the winged fruits and seeds, as of *Combretum, Terminalia glabra,* the "Ain," which on account of its 5-winged fruit has been called *Pentaptera, Hiptage Madablota,* many other *Malphigiaceæ,*

Cardiospermum Halicababum, Begonias, many *Umbelliferous* plants, grasses, &c., where the entire fruit is winged; of all *Bignoniaceæ*, as *Oroxylum indicum* and *Heterophragma Roxburghi*, the horse radish tree, *Moringa pterygosperma* and many *Sterculiaceæ*, as *Pterospermum acerifolium*, *P. suberifolium*, *Melochia velutina*, &c., and in several other plants, where the seeds are winged. Occasionally the fruit is enclosed by a withering calyx or bracts, that serve as appliances for flight, as in *Physalis* and *Bougainvillea*. Very small seed which are of frequent occurrence and the spores of *cryptogamous* plants are also largely distributed by the wind. Finally, the actual force of the wind materially assists other plants in dropping their heavy fruits, which on account of their often round shape then continue their fall for some distance. In the case of the famous Rose of Jericho, *Anastatica hierochuntica*, and a few *Selaginellass*, the entire shrivelled plant, with seed and all, is carried away by the wind.

The action of water in regard to distributing seeds is of less importance now than in former periods. But in the times of the great physical revolutions which our globe has undergone, before assuming its present shape, and long before the existence of man, the great majority of plants must have been distributed through the agency of water,—it is at least very difficult otherwise to explain the wide range of distribution for certain species, which have been preserved and identified in a fossil state. It is moreover probable that the sea of those periods has been free of salt, and consequently not so injurious to plant life as it at present is. This theory has, however, been severely disputed. It is remarkable to notice that adaptation of fruits and seeds for distribution by water is now-a-days mostly found in such plants that are nearest allied to the gigantic herbs of former periods, as in the fruits and seeds of several palms, and in the spores of many cryptogamic plants. The structure of the cocoanut is a good example of such fruits. Under the hard shell is found a thick layer of fibre, which is evidently intended for keeping the nut afloat, while the kernel abounds in fatty substances, which further protect the germ against the injurious effects of water. In other palm fruits, as in the African oil palm, *Elais guineensis*, the fibre is replaced by a layer of fat or solid oil, which may be regarded both as an adaptation for floating and as a protection against water. The large distribution of especially the cocoanut palm in all tropical countries, as also the

splendid vegetation of many Coral islands may, to a certain extent, be attributed to distribution by the sea, though it is a fact that salt water will kill most germs of plant life, unless they are protected by the above or similar means. Other fruits and seeds—sometimes whole plants—are occasionally distributed by fresh water, rivers, streams, or floods, but as a whole, this agency cannot be considered a very important one. More active is the rain, and in colder climates the snow and the ice. The principal action of rain in regard to distribution of plants is to bury the seed in the ground, and as a whole to assist in the germination of seeds. Seeds of some plants, as many *Geraniaceæ*, several grasses, &c., are *hygroscopic*—a quality which by alternative expansions and contractions causes a certain movement, probably intended for shifting the seeds from one place to another; and according to observations by F. Darwin, for burying the seeds in the ground.

Though animals, birds, and insects but too frequently damage our choicest plants and fruits, their assistance in the distribution of plants is very important, and seeds and fruits are frequently adapted to take advantage of this fact.

The hairy or woolly appendages of seeds and fruits, which I have mentioned as adaptations for flight, as also the pubescent and tomentose seeds that frequently occur in *Malvaceous* plants, &c., are often of such a nature that they adhere to the skin of animals, and are distributed by these. In other cases seeds and fruits are provided with *hooks, bristles, awns, glands, tubercles*, or similar appendages, which cause them to stick to the skins of animals. Such structures are common features in many grasses, *Umbelliferæ*, *Compositæ, Rubiaceæ*, &c., and are frequently met with in common weeds, as in *Achyranthes aspera, Sida carpinifolia, Mimosa pudica, Paracaryum, Plumbago zeylanica*, &c. More direct is the agency of monkeys, flying foxes, and larger birds, which are frequently attracted by the colour and fragrance of the succulent fruits, eat them and throw the seeds away, often at a considerable distance from the place of production. Birds as a whole are still more active distributors of plants, at least of those numerous species that have a berried, baccate or drupaceous fruit. Such fruits have generally a gay colour, are frequently sweet and aromatic, and are altogether well suited to tempt the birds. Experience has also established the fact that many seeds fail to germinate, unless having passed through the birds. Such seeds may, however, succeed when submitted

to fermentation. This is the case with many Indian species of *Ficus*, and you will all have observed how frequently plants of "Peepul," *Ficus religiosa*, "Banyan," *Ficus indica*, and "Umbar" *Ficus glomerata*, spring up on walls, roofs, and on stems of other plants, &c., on places where the seeds could not have been deposited except by birds. The naturalisation in India of several plants, as the *Guava*, the *Custard apple*, *Lantana camara*, *Passiflora suberosa*, *Rauwolfia canescens*, *Rivinia*, and many others may be explained by the action of birds. It is, however, worth noticing that the seeds of such fruits are generally well protected, either by a hard shell or by acrid qualities, as in the custard apple and the guava. Several species of plants are said to be distributed by the aid of insects, and as examples of such have been mentioned oranges, limes, papayas and coffee.

The plants themselves have occasionally fruits, that in force of their peculiar structure, greatly assist in spreading the seeds. Such fruits are the *elastically bursting* seed-vessels of *Oxalis corniculata*, *Balsams*, *Momordica Balsamina*, *Rungia parviflora*, *Calotropis gigantea*, &c. The *sudden bursting* of the fruit, even when not elastic, will frequently occasion a shock, sufficiently strong to spread the seeds. In other cases the seeds remain in the fruit after its bursting, but have then generally some other adaptation for distribution, as the *winged* seeds of *Pterospermums*, the *shining bright red seeds* of *Adenanthera pavonina*, which, probably owing to their colour, are carried away by birds or insects, or the birds are attracted by the *gay colour of the pericarp*, as in *Sterculias*, *Tabernæ montana crispa*, *Gymnosporia Rothiana*, *Momordica*, *Charantia*, &c. The *sweet arillus* of many seeds, as found in *Pithecolobium dulce*, is probably a similar adaptation.

A very peculiar feature, evidently intended to effect a dense growth of plants of the same species, within suitable localities, &c., at the same time protecting the seed against salt water, is represented by some of our sea shore plants, which form the well known Mangrove swamps, as *Rhizophora* and *Ægiceras*. In these the ripe seed germinates *on the mother plant*, and with its long radicle and narrowly adpressed leaves forms a stick-like plant. This, when finally separaing, buries itself in the mud, where it, on account of its shape, is singularly adapted to withstand the movements of the tide. A somewhat similar example is afforded by *Crinum asiaticum*, where the seeds frequently germinate in the capsule and form small bulbs.

Only lately I noticed that the spores of an aquatic fern brought from Rutnagherry, a species of *Ceratopteris*, germinate and form their prothallium on the lower portion of the plant.

Many plants principally owe their distribution to other parts than to seeds, which then occasionally fail to come to perfection. Such plants are as a rule much more difficult to destroy than seedlings. The parts which serve to distribute the plants are, in such cases, *bulbs, tubers, rhizomes*, but principally *stoloniferous roots*, as in many common grasses, as *Cynodon dactylon, Sporobolus diander, Chloris barbata, Dactylis lagopoides*, &c., or rooting stems or *runners*, as in *Hydrocotyle asiatica, H. rotundifolia, Oxalis corniculata, Ipomœa biloba and I. aquatica, Lippia nodiflora*, &c. Rarely the *flower stem* is creeping and gives rise to new plants, as in the not uncommon *Launæa pinnatifida*. Among Indian plants a few reproduce themselves by parts of the *leaves*, as *Bryophyllum calycinum*.

All the artificial means of propagation are founded on the fact that every part of a stem or leaf has the power of forming a new plant, when brought under favourable conditions, and I think they are too well known to require mention here.

But in considering the means of artificial propagation, it is only natural to think of cultivation as a cause, and a very important one too, of distribution of plants. By this not only a vast number of economical and ornamental plants have been distributed over the whole globe, but many plants have also unintentionally been naturalised in foreign countries as followers of cultivated plants. In regard to cultivation I may venture to say that in no other branch of natural science have so successful and astonishing results been obtained through the influence of man. The prosperity of most countries does in fact to a great extent depend upon cultivation, and I do not think I exaggerate when saying that by far the greatest part of the enormous Indian trade is due to cultivation, all the principal articles of export being vegetable products.

Such astounding results have however not been obtained without labour, the object of which has been to create better varieties, partly by selection and partly at the cost of extinction of the natural means of protection and adaptation for distribution found in the original plants.

Great successes in cultivation have been achieved in India, but I do not think that it is sufficiently appreciated that such results are frequently in the first instance due to experiments in botanical

gardens, among which the Calcutta garden has taken the lead by distributing such important plants as tea, cinchona, potatoes and most English vegetables. There still remains a vast field for further progress, either by introducing exotic economical plants, or what I think is still more important, by careful examination of the qualities of the vast number of Indian plants, and how these may be improved and turned to account by cultivation.

The Hon'ble Mr. Justice Hart proposed a vote of thanks to Mr. Carstensen for his interesting lecture, and the meeting then ended.

HINTS ON COLLECTING AND PRESERVING HYMENOPTERA.

By Captain C. T. Bingham,

Deputy Conservator of Forests, Rangoon.

Hymenoptera.—Ants, bees, and wasps *can* be collected and preserved in spirits: but somehow such specimens when set out and placed in the cabinet never look well. Ordinary methylated spirits, rectified spirits of wine, whisky, brandy, gin, or whatever alcoholic medium individual collectors fancy, all alter or cause the colour of delicately marked specimens to fade, render them brittle, and invariably clog the tufts of fine hair and the down which adorn so large a number of the species belonging to this order. Ants alone do not suffer so much, especially if good methylated spirit, diluted with about one-third of its quantity of distilled water, is used.

Bees and wasps should be killed in an ordinary insect collecting bottle, containing cyanide of potassium made into a paste with plaster of Paris. A killing bottle just as effective can be made with far less trouble in the following way :—Take an ordinary four or eight ounce wide-mouthed bottle, or for very large insects, a prune jar does very well, fit with a tight cork long enough to project well above the rim of the bottle and give a good hold to the fingers. Put a lump or two of cyanide of potassium at the bottom, and cover over this to the depth of an inch or an inch and a half with coarse dealwood saw-dust (the coarser the better). Lastly, wedge a piece of thin cardboard, pierced with large pin holes and cut down exactly to the size of the inside of the bottle, on the top of the saw-dust. In very hot dry weather it will be as well before putting in the cardboard on the top to damp the saw-dust slightly. The advantages

of this bottle are that it can be prepared or renewed in a few minutes, and that its effectiveness lasts for so long a period. I have bottles at present in use that I prepared more than two years ago. When the overlying cardboard gets saturated with the cyanide and rotten, a fresh piece should be put over it, which ought also to be pierced with pin holes. Occasionally, from the jolting a collecting bottle gets in the collector's pocket or wallet, the saw-dust and cyanide get loose, and the latter is apt then to injure with its weight and the shaking any delicate specimens there may happen to be in the bottle; but with a little care in occasionally pressing down the cardboard with the top of a pencil say, such mishaps can well be avoided. The reason I have recommended dealwood saw-dust is that having once prepared a bottle with teak saw-dust, I was surprised to find specimens of wasps I had caught and left in the bottle for a day or two change colour in a most wonderful manner; yellow was the only colour affected, and this changed to a bright crimson,* a pleasing æsthetic contrast with black no doubt; but the deuce and all if the specimen altered in colour happens to be your sole example of a rare species. What it was in the teakwood and cyanide of potassium blending that affected the yellow colours in the insects I am not chemist enough to determine. Dealwood saw-dust seems to be unaffected by the cyanide.

For capturing Hymenoptera an ordinary butterfly-net will do, only the meshes of the mosquito gauze of which it is made should be somewhat fine, otherwise diminutive Chrysidæ, Scoliadæ and Mutillidæ will manage to creep out.

As soon after capture as possible, the insects if large should be pinned into a pith or cork lined store-box, or if very tiny fixed with a little pin's-head drop of clear gum on the apex of a small isosceles triangle cut out of thin cardboard (ordinary visiting come in handy here), and with a pin passed through the cardboard put into the store-box. When the pin is put into the insect itself it should be passed through the thorax, and out at the breast between and a little behind the front pair of legs. In all cases use long pins, so as to keep the insects well clear of the floor of the box or cabinet-drawer. It is not absolutely necessary but with all, except the smallest insects, to facilitate examination, it is better to set out the wings horizontally at right angles to the body as in flight, and the legs as much

* I can give any brother collector specimens of *Pelopœus spirifex* and *Polistes hebræus*, colours brilliant crimson and black—unique, I assure them.

in the natural position of the insect walking as possible. For this setting boards similar to those used for butterflies will be required.

If Hymenoptera are collected simply with a view to transmission by the post, after killing in the cyanide bottle they can be put into little triangular envelopes of paper, as butterflies very often are, each insect, however small, requiring a separate envelope. They will not, however, keep long thus, the fat-bodied heavy bees especially getting mouldy, greasy, full of mites, and often rotting. For quick transmission, however, this method of collecting answers very well, a number packing into a small box.

Hymenoptera as a rule affect bright sunny spots and flowering trees and shrubs. My experience is that insects belonging to the families Sphegidæ, Pompilidæ and Larridæ keep as a rule to low bushes, and are often to be found walking on the ground in an excited eager way searching for spiders, grass-hoppers, &c., with which they store their mud nests. Scoliadæ are sluggish creatures and can be picked off flowers with a pair of forceps. Mutillidæ, Ichneumonidæ and Tenthredinidæ are brutes to find and catch, and when caught, to preserve with legs, antennæ, and ovi-positors intact.

Formicidæ (ants) are everywhere. They can, as I have already said, be collected in spirits; but specimens should always be set up fixed by a drop of gum on cardboard triangles as described. It is difficult often to get hold of males and queens, and the collector has nearly always to fight for them. In default, however, one is thankful to get hold of the workers or neuters.

I shall be thankful if any of the readers of this magazine will collect hymenoptera and send them to me packed in paper envelopes in a small tin-box by post. In return I will engage to send back all specimens sent, naming such as I am able to identify, or to exchange for them Burmese hymenoptera, or named specimens in paper of Burmese butterflies.

SOME COLD WEATHER NOTES FROM GUZERAT.

By Captain E. F. Becher, R.A., F.Z.S.

This last cold weather in Guzerat has been chiefly remarkable for the scarcity of snipe, the cause of which was want of late rains, large jheels, in which snipe last year were shot in December, being dry by the end of October. Duck have also been scarcer, I am told, than last

year even in places where there was plenty of water. The snipe have evidently gone on to other places, I hear from Kirkee, for instance, that it has been a very good snipe year there. Quail have also been scarce, and I have never seen them in any numbers. The most numerous duck have been the Gadwall (*Chaulelasmus streporus*), the White Eye (*Nyroca ferruginea*), the Tufted Duck (*F. cristata*), the Spotted Bill (*Anas pœcilorhyncha*), and of course the Shoveller (*Spatula clypeata*). Of these the Gadwall was in most numbers; the Shoveller was not so numerous, as I was given to understand would be the case.

Sportsmen are very apt to call the Tufted Duck, the Golden Eye, from the fact of its having golden irides. This may give rise to error, as the Golden Eye is the accepted name of *Clangula glaucion*, which, according to Barnes, has only twice been recorded in India. The Spotted Bill was very common, but it is liable to be thought more numerous than in reality, as it is a large, slow-flying bird, and at once attracts attention.

An odd Pochard (*F. ferina*) was occasionally seen in the bag, as also the Red-crested (*F. rufina*). The Mallard (*Anas boschas*) was seen a little oftener both in the bag and out. The Brahminy Duck (*Tadorna casarca*) was, I think, in about equal numbers to the Mallard. During October on one occasion I saw on two tanks large numbers of the Pintail (*Dafila acuta*). Since then I have only seen an odd one or two occasionally, and never a flock.

A Widgeon I never saw shot or noticed alive. As regards the Teal—the Common Teal (*Querquedula crecca*)—was common. Of the Garganey (*Q. circia*) I only saw a few, and none in full plumage. The Marbled Teal (*Ch. angustirostris*) was fairly common, which I believe is unusual. This species can easily be passed over, when flying, as a duck, on account of its large expanse of wings. The Cotton Teal (*Nettopus coromandelianus*) at the commencement of the season was to be seen on nearly every tank, but latterly it became decidedly rare. Several Whistling Teal (*Dendrocygna javanica*) were noticed from time to time.

The only Goose I saw shot was the Grey Goose (*Anser cinereus*). Geese flying over were frequently seen, which were no doubt of this species.

On one occasion near Dungarwa, on approaching a very "ducky" looking tank, my shikari told me that there would be no duck there, as there were several muggers in it, and, true enough, there was not

a single duck or coot to be seen on the surface. This seems strange, as on other tanks, where muggers also live, I have seen plenty.

One early morning a long single rank of Pelican flew over, doubtless *Pelicanus javanicus*; there were a great number of them. This is the only occasion on which I saw a pelican of any species, except once, when I saw a solitary individual of the above.

Tern were numerous. The only specimen I shot was the Whiskered Tern (*Hydrochelidon hybrida*). I do not remember seeing many Gulls proper.

I did not notice any Spoonbills until December; I do not know whether it is well known what a good bird it is for the table; its method of feeding is peculiar, advancing rapidly and moving its bill from side to side, in fact zig-zag.

A female Florican was shot in November, and I saw another during December.

I see that Barnes in his "Birds of Bombay" gives as the common name for the Common Crane *Kullum*, and for the Demoiselle Crane *Karonch*, which I presume is the same as *Koong*; in Sind the contrary was the case.

Our last day's duck-shooting was on the 18th February, when the majority seemed to have acquired that strong flavour called "fishy," on which account we did not go after them any more, as it would have been useless slaughter.

I did not examine every Snipe we shot, but I did a good number, and did not come across a single Pintail.

Flamingo were very common near Dungarwa; on one large tank I think their numbers might be reckoned by thousands, and from a little distance, when they were all on the wing together, their white plumage made it a most beautiful sight: all I saw were *Phœnicopterus antiquorum*.

From birds to beasts. I believe that Ahmedabad District has been famous for the number of antelope. Last year two French gentlemen destroyed a great number, over a hundred they say, with the result that in places where last year were hundreds, there now are hardly any, and none with any heads worth obtaining. In January I was in the neighbourhood of Parantij and Sonasan, a well-known locality for buck. I saw one with six inch horns and a doe. The number of snipe, &c., also shot by the above two sportsmen (?) was enormous and useless. They arrived in the country with the highest introductions, and the District Officers were requested to do all

they could to put them in the way of getting sport, with the above result. They have reappeared again this year on the scene of their former massacre.

Since writing the above, I have heard that the Nal Cup cannot be run in the usual country, as the pig have left the neighbourhood on account of want of water.

ON THE LEPIDOPTERA OF KARACHI AND ITS NEIGHBOURHOOD.

By Col. C. Swinhoe, F.L.S., F.Z.S., &c.

PART II.

HETEROCERA.

Sphingidæ.

1

Macroglossa stellatarum.

Sphinx stellatarum, Linn., Syst. Nat. 1, 2, p. 803 (1767).

One specimen, July, 1879; it is a common insect at Quetta and in the Bolan.

2

Macroglossa gyrans.

Macroglossa gyrans, Walker, viii., p. 91 (1856).

July, 1885. Very plentiful for about a fortnight.

3

Macroglossa belis.

Sphinx belis, Cram., Pap. Exot., i., p. 147, pl. 94, f. C. (1776).

Macroglossa assimilis, Swainson, Zool. Ill., Ser. i., vol. i., pl. 64 (1820).

" *zena*, Boisd., Spec. Gén. Lep. Hist., 1875, i., p. 337.

" *pyrrhulla*, Boisd., l. c., p. 338.

Common in July, 1885.

4

Chœrocampa elpenor.

Sphinx elpenor, Linn., Faun. Suec., p. 288 (1746).

One example identical with the British type received from the Municipal Museum taken in Karachi.

5

Chærocampa theylia.

Sphinx theylia, Linn., Syst. Nat. 12, 803, 24 (1767).
„ *bœchaviæ*, Fabr. Sp. Ins. ii., 148, 39.
„ *pluto*, Fabr. Sp. Ins. ii., 148, 40.
„ *pinastrina*, Martyn, Psyche, pl. 30, f. 85 (1797).
„ *octopunctata*, Gmel., Syst. Nat. i., 5, 2386.

One taken in July, 1886, and three in the following September.

6

Chærocampa celerio.

Sphinx celerio, Linn., Syst. Nat. x., 491 (1758).
„ *tisiphone*, Linn. l. c. 492.
Hippotion ocys, Hübn., Verz. bek. Schmett, 135, 1451 (1816).
Deilephila inguinalis, Harris, Ex., p. 93, pl. 28, f. 1.

November and December.

7

Chærocampa oldenlandiæ.

Sphinx oldenlandiæ, Fabr., Sp. Ins. ii., 148 (1781).
Xylophanes gortys, Hübn., Samuel. Exot. Schmett. Zutr., f. 513, 514 (1825).

December.

8

Chærocampa alecto.

Sphinx alecto, Linn., Syst. Nat. x., p. 492 (1758).
„ *cretica*, Boisd., Ann. Soc. Linn., Paris, vi., p. 118, pl. 6, f. 5 (1827).

Very plentiful in July, 1886. One taken in August and three in September.

9

Chærocampa nessus.

Sphinx nessus, Drury, Ill. Ins. Exot. ii., p. 46, pl. 27, f. i. (1773).
„ *equestris*, Fabr. Ent. Syst. ii., p. 365 (1773).
Chærocampa rubicundus, Schanfuss., Nunquam Otiosus i., p. 18, (1870).

One taken October, 1879.

10

Deilephila livornica.

Sphinx livornica, Esper., Ausl. Schmett. ii., pp. 87, 196, pl. 8, f. 4 (1785).
„ *lineata*, Fabr., Sp. Ins. ii., 147, 34.

March and May, 1879-80. July, August and September, 1886, in great plenty.

11

Daphius nerii.

Sphinx nerii, Linn., Syst. Nat. i., 2, p. 798 (1767).

March, April and May, very common.

12

Polyptichus dentatus.

Sphinx dentata, Cram., Pap. Exot. ii., p. 42, pl. 125, f. G., (1779).

Two taken in October, 1885.

13

Acherontia styx.

Acherontia styx, Westw., Cab. Or. Ent., p. 88, pl. 42, f. 3 (1848).

July and August very common.

14

Protoparce orientalis.

Protoparce orientalis, Butler, Trans. Zool. Soc. ix., p. 609, pl. 91, f. 16 and 17, larva and pupa (1876).

March to September. Very plentiful during July, August and September.

15

Nephele hespera.

Sphinx hespera, Fabr., Syst. Ent., p. 546 (1775).

„ *chiron*, Cram., Pap. Exot. ii., p. 62, pl. 137, f. E (1779).

„ *didyma*, Fabr., Sp. Ins. ii., p. 148 (1781).

„ *morpheus*, Hübn., Verz. bek. Schmett., p. 133 (1816).

Peregonia obliterans, Walker, xxxi., 28 (1864).

One taken in August, 1886.

16

Hemaris hylas.

Sphinx hylas, Linn., Mant. i., p. 539 (1771).

„ *picus*, Cram., Pap. Exot. ii., p. 83, pl. 141, f. B (1777).

December, 1885.

BOMBYCES.

"ZYGÆNIDÆ."

17

Syntomis cyssea.

Sphinx cyssea, Cramer, Pap. Exot. iv., p. 124, pl. 355, f. B (1782).

Zygæna collaris, Fabr., Ent. Syst. iii., i., 388, 7 (1793).

Syntomis schœnerrhi, Boisd., Mon. Zyg., p. 112, pl. 7, f. 1 (1829).

„ *cuprea*, Prittivitz, Stett. Ent. Zeit., p. 277 (1867).

June, 1885; February, March and April, 1886, in great numbers.

18

Psichotoë duvancelii.

Psichotoë duvancelii, Boisd., Mon. Zyg., p. 129, pl. 8, f. 5 (1829).

Three examples received from Jurruck, near Karachi.

19

Euchromia polymena.

Sphinx polymena, Linn., Syst. Nat. ii., 806, 40 (1766).

Several examples received from Mr. Murray, taken in July, 1882.

AGARISTIDÆ.

20

Ægocera venulia.

Phalæna venulia, Cram., Pap. Exot. ii., 107, pl. 165, f. D (1779).

One taken in July, 1882; two in August, 1886.

NYCTEOLIDÆ.

21

Earias insulana.

Tortrix insulana, Boisd., Faune Ent. Madag., p. 121, pl. 16, f. 9 (1833)

Earias frondosana, Walker, xxvii., 204 (1863).

„ *simillima*, Walker, xxxv., 1775 (1865).

Common in February; also from September to November.

22

Earias speiplena.

Aphusia speiplena, Walker, xii., 770.

Micra partita, Walker, xxxiii., 799.

August and September in great numbers.

23

Earias tristrigosa.

Earias tristrigosa, Butler, P. Z. S., 1881, p. 614.

Common throughout the year.

LITHOSIDÆ.

Hypsinæ.

24

Lacides ficus.

Noctua ficus, Fabr., Ent. Syst. iii., 27, 62.

August, 1886.

Lithosinæ.

25

Deiopeia pulchella.

Tinea pulchella, Linn., Syst. Nat. i., 2, 884.

Common throughout the year.

26

Deiopeia lotrix.

Phalæna noctua lotrix, Cram., Pap. Exot. ii., p. 20, pl. 109, f. E (1777).

Hubb River, November, 1879.

27

Deiopeia thyter.

Deiopeia thyter, Butler, Trans. Ent. Soc. 1877, p. 361.

Hubb River, November, 1879.

Arctidæ.

28

Creatonotos interrupta.

Phalæna interrupta, Linn., Syst. Nat. Phul. i., v., p. 2553, 116.

Bombyx francisca, Fabr., Mant. Ins. ii., pp. 131—200 (1787).

March, 1886.

29

Aloa lactinea.

Phalœna lactinea, Cram., Pap. Exot. ii., 58, pl. 133, f. D.

Bombyx sanguinolenta, Fabr., Desc. Ins. Ind., pl. 33.

A variety without the red collar was in great plenty in August, 1885, and July, 1886.

LIPARIDÆ.

30

Charnidas testacea.

Cycnia testacea, Walker, iii., p. 683.

May, 1886.

31

Lœlia pallida.

Lœlia pallida, Moore, Trans. Ent. Soc. 1884, p. 35.

Plentiful in August, 1885, and a few in September and October; taken also in the same months in 1886.

32

Artaxa pusilla.

Artaxa pusilla, Moore, Lep. Ceylon ii., p. 86, pl. 112, f. 14 (1882).

Euproctis pygmœa, Moore, Desc. Lep. Coll. Atk. i., p. 48, (1879) (*nom preoc.*)

Males common from April to October; the female (probably an apterous insect) is unknown.

33

Somena subnotata.

Orvasca subnotata, Walker, xxxii., p. 502, ♂ (1865).

August and November, 1879; February, 1880.

34

Thiacidas postica.

Thiacidas postica, Walker, v., p. 1028.

August and September.

NOTODONTIDÆ.

NOTODONTINÆ.

35

Anticyra combusta.

Anticyra combusta, Walker, v., p. 1092.

Dinara lineolata, Walker, vii., p. 1699 (1856).

One taken at Karachi, date not noted.

36

Ingura subapicalis.

Abrostola subapicalis, Walker, xxii., p. 883.

Ingura recurrens, Walker, xv., p. 1779.

Plentiful in July, 1886.

CALPINÆ.

37

Orœsia vagabunda.

Orœsia vagabunda, Swinhoe, P.Z.S., 1884, p. 519, pl. 47, f. 5.

May, 1880.

LASIOCAMPIDÆ.

38

Taragama ganesa.

Bombyx ganesa, Lefebvre, Zool. Journ. iii., p. 211 (1827).

,, *siva*, Lefebvre, *loc. cit.*, p. 210.

Megasoma albicans, Walker, vi., 1450.

May and September.

39

Chilena similis.

Chilena similis, Walker, v., p. 1071.

Hyderabad, April, 1886.

COSSIDÆ.

40

Zeuzera bivittata.

Zeuzera bivittata, Walker, xxxii., p. 586.

Two taken in July, 1886, and one in the following month.

41

Zeuzera acronyctoides.

Brachylia acronyctoides, Moore, P. Z. S., 1879, p. 411, pl. 34, f. 4.

April and May.

42

Phragmatœcia fœda.

Phragmatœcia fœda, Swinhoe, P.Z.S., 1884, p. 515, pl. 47, f. 1.

January, February and March.

NOCTUES.

LEUCANIDÆ.

43

Leucania loreyi.

Leucania loreyi, Duponchel, Hist. Nat. Lep., France iv., p. 81, pl. 105, f. 7.

February to May.

44

Sesamia inferens.

Leucania inferens, Walker, ix., p. 105.

Hyderabad, April, 1886.

HELIOTHIDÆ.

45

Heliothis peltigera.

Noctua peltigera, Denis, Wien. Verz., p. 89.

„ *barbara*, Fabr., Ent. Syst. iii., 2, iii., 334.

„ *florentina*, Esper., Schmett., iv., pl. 135, f. 2.

„ *scutigera*, Bork., Eur. Schmett., iv., 93, 37.

„ *straminea*, Donov., Brit. Ins. ii., pl. 61.

Phalæna alphea, Cramer, Pap. Exot. iii., 99, pl. 259, f. F.

June to October common.

46

Heliothis armigera.

Noctua armigera, Hübn., Noct. ii., p. 180, pl. 79, f. 370 (1804).

January, 1880, in great numbers; July and August, 1885; September, 1886.

47

Heliothis rubrescens.

Thalpophila rubrescens, Walker, xv., p. 1681 (1858).

May, 1885 in great numbers, and again in October, 1886.

48

Adisura leucanioides.

Adisura leucanioides, Moore, P.Z.S., 1881, p. 368.

Muggur Pir, August, 1880.

ACONTIDÆ.

49

Xanthodes stramen.

Xanthodes stramen, Guenée, Noct. ii., 210, 976.

September, 1885; July August, and September, 1886.

50

Xanthodes imparata.

Xanthia imparata, Walker, x., 467.

July, 1886.

51

Xanthodes innocens.

Xanthodes innocens, Walker, p. 1752.

September, October and November.

52

Xanthodes arcuata.

Xanthodes arcuata, Walker, xii., p. 779.

February, 1880.

53

Euphasia catenula.

Noctua catenula, Sowerby, Brit. Mus. 29, pl. 14.

Desmophora elegans, Steph., Cat. Brit. Mus. 6398

Miani, February, 1886; Karachi, June, 1886.

54

Euphasia catenula.

Euphasia catenula, Walker, xxxiii., p. 780.

September, 1885.

55

Acontia costalis.

Acontia costalis, Walker, xxxiii., 784.

August, 1885.

56

Acontia basifera.

Acontia basifera, Walker, xii., 793.

Hubb River, September, 1885; Karachi, July, August and September, 1886.

57

Acontia crocata.

Acontia crocata, Guenée, Noct. ii., 218, 989.

August, 1886.

58

Acontia scanda.

Acontia scanda, Felder, Reise Novara, pl. 108, f. 27, ♀.

September, 1886.

59

Acontia hortensis.

Acontia hortensis, Swinhoe, P. Z. S., 1884, p. 517, pl. 47, f. 7.

September, 1880 and 1885.

60

Bankia opella.

Acontia opella, Swinhoe, P. Z. S., 1885, p. 456, pl. 27, f. 16.
September, 1885; in great numbers in July and August, 1886.

61

Tarache inda.

Acontia inda, Felder, Reise Novara, pl. 108, f. 23, ♀.
September, 1886.

62

Marimatha lactea.

Marimatha lactea, Swinhoe, P. Z. S., 1884, p. 522, pl. 48, f. 7.
May, 1880; September, 1885.

ERASTRIDÆ.

63

Erastria futilis.

Erastria futilis, Swinhoe, P. Z. S., 1884, p. 517, pl. 47, f. 8.
March, 1880.

ANTHOPHILIDÆ.

64

Thalpochares rivula.

Thalpochares rivula, Moore, Desc. Lep. Coll. Atk. ii., p. 140 (1882).
July, 1885; April, 1886.

65

Anthophila derogata.

Micra derogata, Walker, xii., p. 825 (1857).
Hubb River, August, 1880.

66

Anthophila zamia.

Anthophila zamia, Swinhoe, P.Z.S., 1884, p. 518, pl. 47, f. 12.
April, 1880.

67

Anthophila bulla.

Anthophila bulla, Swinhoe, P.Z.S., 1884, p. 518, pl. 47, f. 9.
From October to January common.

68

Micra chalybea.

Micra chalybea, Swinhoe, P. Z. S., 1884, p. 518, pl. 47, f. 10.
September and October common.

69

Micra furia.

Micra furia, Swinhoe, P. Z. S., 1884, p. 519, pl. 47, f. 13.

September, 1880.

70

Micra baluæ.

Micra baluæ, Swinhoe, P. Z. S., 1884, p. 519, pl. 47, f. 14.

August to October common.

71

Leptosia quinaria.

Leptosia quinaria, Moore, P. Z. S., 1881, p. 371.

September to November.

ORTHOSIDÆ.

72

Orthosia infrequens.

Orthosia infrequens, Swinhoe, P.Z.S., 1884, p. 517, pl. 47, f. 11.

July, 1880.

NOCTINIDÆ.

73

Agrotis aristifera.

Agrotis aristifera, Guen., Noct. i., p. 266 (1852).

" " Walker, x., p. 348 (1856).

February, 1880; April, 1886.

74

Agrotis segetum.

Agrotis segetum, Schiff., Wien. Verz., p. 252 (1776).

Hyderabad, April, 1886.

75

Spælotis undulans.

Spælotis undulans, Moore, Ann. Mag. Nat. Hist. (5) i., 1878 p. 233.

November, 1880.

APAMIIDÆ.

76

Ilattia cephusalis.

Ilattia cephusalis, Walker, xvi., 209.

Miana inornata, Walker, xxxii., 677.

Perigea leucospila, Walker, xxxii., 683, ♂

August, September and October common

77

Caradrina sabulosa.

Caradrina sabulosa, Swinhoe, P.Z.S., 1884, p. 516, pl. 47, f. 6.

April, May and June.

78

Caradrina venosa.

Caradrina venosa, Butler, Ent. Mo. Mag., xvii. p. 111. (1880)

November, 1880.

79

Caradrina insignata.

Caradrina insignata, Walker, x., 295.

May, June and July.

80

Spodoptera cilium.

Spodoptera cilium, Guenée, Noct. i., 156, 249.

,, *insulsa,* Walker, xxxii., 648.

All the year round. Very plentiful in August.

81

Prodenia nubes.

Spodoptera nubes, Guen., Noct. i., 155, ♂ (1852).

,, *filium,* Guen. Noct. i., 155, ♀.

Prodenia infecta, Walker, ix., 196 (1856).

,, *insignata,* Walker, ix., 197.

Agrotis transducta, Walker, x., 344, ♀.

Laphygma squalida, Walker, xxxii., 652, ♂.

Prodenia venustula, Walker, xxxii., 654, ♀.

Agrotis submarginalis, Walker, xxxii., 699, ♀.

Prodenia permunda, Walker, ix., 723, ♀.

Taken on board the steamer leaving Karachi, October, 1886

A rather variable insect, common in most parts of India, easy of identification, but Walker appears to have given a new name to every shade of colour it assumes.

82

Prodenia littoralis.

Hadena littoralis, Boisd., Faune Ent. Madag. Lep., p. 91, pl. 13, f. 8, ♀ (1834).

Neuria retina, Freyer, Beitr. Schif. v., 161, pl. 478, f. 2, 3, ♂ ♀ (1846).

Prodenia celigera, Guen., Noct. i., p. 164, ♂ ♀ (1852).

,, *testaceoides,* Guen., Noct. i., p. 165, pl. 6, f. 7, ♀.

,, *glaucistriga,* Walker, ix., 197, ♂ (1856).

Prodena subterminalis, Walker, ix., 197, ♀.

,, *declinata*, Walker, xi., 723, ♂.

April, 1886. Also a common insect, rather variable in colour, with a name given for every variation.

83

Laphygma exigua.

Noctua exigua, Hübner, Samml. Ex. Schm. Noct., f. 362.

July to October, common.

84

Ozarba itwarra.

Ozarba itwarra, Swinhoe, P. Z. S. 1855, p. 452, pl. 27, f. 14.

Very common in August and September, 1886.

PLUSIDÆ.

85

Plusia chrysitina.

Phalæna noctua chrysitina, Martyn, Psyche, pl. 21 (1797).

Noctua aurifera, Hübner, Ent. Schmett., Noct., pl. 98, f. 463.

Kipra, near Karachi, April, 1886.

86

Plusia verticillata.

Plusia verticillata, Guenée, Noct. ii., 344.

November to March.

87

Plusia extraheus.

Plusia extraheus, Walker, xii., 929.

March and April; July and August.

EURHIPIDÆ.

88

Eutelia discistriga.

Eutelia discistriga, Walker, xxxii., 823.

July, August, and September.

GONOPTERIDÆ.

89

Cosmophila xanthindyma.

Cosmophila xanthindyma, ♂, Boisduval, Faun. Ent. Madag. Lep. p. 94, pl. 13, f. 7 (1834).

,, *indica*, ♀ Guenée, Noct. iii., 396, 1256 (1852).

Cirrœdia variolosa, Walker, xiii., 750.

July, August and September.

90

Gonitis involuta.

Gonitis involuta, Walker, xiii., 1003 (1857).
,, *basalis*, Walker, xiii., 1004, ♀.
Tiradiata colligata, Walker, xxxiii., 870 (1865).

Common in June.

POAPHILIDÆ.

91

Poaphila reflexa.

Plecoptera reflexa, Guen., Noct. ii., 431, 1303.
Trigonodes grammoides, Walker, xv., 1833.
Poaphila simplex, Walker, xv., 1840.
,, *hamifera*, Walker, xxxiii., 992.

June, July and August.

XYLINIDÆ.

92

Jarasana lativitta.

Jarasana lativitta, Moore, Desc. Lep. Coll. Atk. ii., p. 132.

July, 1879; April and May, 1886.

CATEPHIDÆ.

93

Anophia olivascens.

Anophia olivascens, Guen., Noct. iii., 48, 1379.

September, 1886.

HYPOGRAMMIDÆ.

94

Selepa docilis.

Selepa docilis, Butler, P. Z. S., 1881, p. 619.

April and May ; September to December common.

95

Plotheia ænea.

Othora ænea, Swinhoe, P. Z. S., 1884, p. 520, pl. 48, f. 1.

July, 1880.

POLYDESMIDÆ.

96

Pandesma quenavadi.

Pandesma quenavadi, Guen., Noct. ii., 338, 1310.
Cerbia fugitiva, Walker, xiv., 1365.

June, July and August in great numbers.

97

Pandesma similata.

Pandesma similata, Moore, P. Z. S., 1883, p. 24.

Cocoons from Shikarpur emerged April, 1879.

98

Pandesma devia.

Pandesma devia, Swinhoe, P. Z. S. 1884, p. 520, pl. 48, f. 3.

May, June and July.

HOMOPTERIDÆ.

99

Homoptera vetusta.

Polydesma vetusta, Walker, xxxii., 875.

April to July.

100

Alamis infligens.

Homoptera infligens, Walker, xiii., 1068.

July, August and September.

101

Alamis umbrina.

Alamis umbrina, Guen., Noct. iii., 4, 1321.

„ *albicinata*, Guen., Noct. iii., 4, 1322.

July and September, 1866.

OPHIDERIDÆ.

102

Argadesa materna.

Phalæna noctua materna, Linn., Syst. Nat. ii., 840, 117 (1767).

Noctua hybrida, Fabr., Syst. Ent. 593, 11 (1775).

May and July, 1885.

103

Othreis fullonica.

Phalæna noctua fullonica, Linn., Syst. Nat. ii., 812, 16 (1767).

Noctua discoresæ, Fabr., Sp. Ins. ii., 212, 15; Syst. Ent. 593 (1775).

Phalæna noctua pomona, Cramer, Pap. Exot. i., 2, 122, pl. 77, f. C. ♀ (1779).

July, 1886.

OMMATOPHORIDÆ.

104

Patula macrops.

Phalœna attacus macrops, Linn., Syst. Nat. 225 (1768).

Noctua bubo, Cram., Pap. Exot. ii., p. 114, pl. 171, f. A. B. ♂ (1779).

July, 1886.

BENDIDÆ.

105

Hamodes aurantica.

Hamodes aurantica, Guen., Noct. iii. 203, 1603.

January, 1880.

OPHIUSIDÆ.

106

Thyas coronata.

Noctua coronata, Fabr., Syst. Ent. 596, 24 (1775).

„ *leonita*, Fabr., Syst. Ent. 596, 25.

„ *ancilla*, Fabr., Ent. Syst. iii., 2, 17 (1794).

Corycia majica, Hübner, Samml. Exot. Schmett, iii., p. 32, f. 535, 536.

August, 1886.

107

Ophiodes seperaus.

Ophiodes seperans, Walker, xiv., 1357.

July, 1886, in great numbers.

108

Achœa melicerte.

Phalœna noctua melicerte, Drury, Ins. i., p. 46, pl. 23, f. 1 (1770).

Noctua tigrina, Fabr., Sp. Ins. 218 (1781).

Very common in July, 1882, and again in July, 1886.

109

Serrodes inara.

Phalœna inara, Cram., Pap. Exot. iii., p. 78, pl. 239, f. E.

July, 1886.

110

Ophiusa albivitta.

Ophiusa albivitta, Guen., Noct. iii., 271.

July.

111

Ophiusa stuposa.

Noctua stuposa, Fabr., Ent. Syst. iii., 2, 42, 112 (1793).

Ophiusa festinata, Walker, xiv., 1432 (1858).

July, 1886.

112

Ophiusa olympia.

Ophiusa olympia, Swinhoe, P. Z. S., 1885, p. 466.

Taken on board the steamer leaving Karachi, October, 1886.

113

Ophiusa arctotœnia.

Ophius arctotœnia, Guen., Noct. iii., 272.

July, 1886.

EUCLIDIDÆ.

116

Acantholipes affinis.

Docela affinis, Butler, Ann. and Mag. Nat. Hist., ser. 5, vol. V. (1880), p. 225.

October to May, common.

117

Acantholipes acervalis.

Acantholipes acervalis, Swinhoe, P.Z.S., 1886, p. 451.

September, 1885, and January, 1886.

118

Trigonodes hippasia.

Phalœna noctua hippasia, Cramer, Pap. Exot., iii., p. 99, pl. 250, f. E (1782).

Trigonodes compar, Walker, xvi., 1451 (1857).

January to June, common.

REMIGIIDÆ.

119

Remigia archesia.

Phalœna noctua archesia, Cramer, Pap.Exot. iii., p. 145, pl. 273, f. F. G. ♀ (1782).

Remigia bifasciata, Walker, xxxiii., p. 1014 ♀ (1885).

July and August.

120

Remigia frugalis.

Noctua frugalis, Fabr., Ent. Syst. iii., 2, p. 138 (1794).

Remigia translata, Walker, xxxiii., 1015, ♀ (1865).

July to October, common.

121

Remigia arefacta.

Remigia arefacta, Swinhoe, P. Z.S., 1884, p. 52, pl. 48, f. 2.

May, 1880.

(To be continued.)

ZOOLOGICAL NOTES.

HOT WEATHER NOTES IN THE CENTRAL PROVINCES, 1887.

By Captain E. F. Becher, R. A., F. Z. S.

Last hot weather (1887) I spent in the jungles in the Central Provinces, not very far from Nagpore. The following are extracts from notes I wrote down at the time:—

During April I noticed a great number of night jars flying about at dusk and dawn with their perfectly noiseless flight. I was unable to identify the species. They for the most part used to make a constant chirping noise like a cricket. I fancied at the time that it was to attract the various chirping insects in the grass, who would answer, and thus disclose their whereabouts. I could not tell the difference between the sound of the night jar's chirp and that of the insect. A great number of large Cicadæ always used to be seen in the evening and early morning which used to take that locust-like flight. I have a note on the 22nd April: "In the evening, in the jungle, there were in one place hundreds if not thousands of Cicadæ seated on the small trees, which flew off as we passed, to the great danger of our eyes."

On the 17th April I shot two couple of pintailed snipe and eat them; they were not good. I did a good deal of sitting up in *machans* with, as usual, no success. Something always occurred to spoil my chance. On one occasion a tiger woke me up in the early morning by killing the buffalo which I had tied up. It is an abused method of shikar, but I fail to see the reason; for any one who takes an interest in other than the "beasts of the chase" it is most delightful. I used to take my bedding, notebook, water bottle and a couple of *chapatties* for dinner; send all natives back to camp, and spend the whole night there. After one of these nights I find have written: "There seem to be distinct periods of insect annoyance and otherwise, commencing from about 4 P.M. First, innumerable flies, principally a black T-like fly, of sluggish and pertinaceous habits: one's eyes are the principal points of attack. As the sun goes down they disappear, and the Cicadæ turns up with a deafening chorus, but this ceases as darkness sets in, and then the mosquitoes have their time; but I always found that the 12 feet or so of *machan* above the ground is above the thick mosquito stratum; in the same place, but at water level, I have been driven away by them, clothes affording no protection, as they drove their lancets right through. Soon after taking up my position, some jungle or spur

fowl come and peck about by my tree, and perhaps a peacock or two, quite unconscious of my presence. Various birds utter their (to me) strange and loud notes; the monkeys leap from tree to tree, and numerous green parrots and crows, (*C. culminatus*) fly past. My *machan* overlooks a small pool in a nullah, overhung with some reeds and bushes. Round the edges are a great number of bulbuls, and of a small bird, which I could not identify, but whose characteristic was black, with a conspicuous white wing patch, and about the size of a Munia. These were busily engaged in their evening drink, and had taken possession of the adjacent bushes, where also could be seen the Paradise Flycatcher in its full plumage, both of white and brown, with streamer tail and erectile crest; also one or two of the short-tailed brown birds. In the trees are a number of brown vultures. I could not identify them, as I always mix them up, and noted general colour brown, with white chest, patch of ruff and white under the wings, bare or white patch on the thighs; but to my surprise, when I came to look at Barnes' book, I found that this was not enough for identification. These I had disturbed from their attack on the half-eaten carcase. One or two *Halcyon smyrnensis* took occasional dives into the pool. I thought at first that these I saw were smaller than the usual run of *H. smyrnensis*. Now and then a vulture wings his heavy flight from one tree to another with a great flapping of wings. I also see on the reeds and bushes one or two blue flycatchers (*Hypothymis azurea*), a green bee-eater (*Viridis*) taking occasional short flights after some choice morsel. A solitary Scavenger Kite—more familiar perhaps with human beings—which has all this time been sitting gorged and draggled on a branch, sets the example of beginning again, and flops down near the carcase; of course one or two black crows have all this time been pecking away or standing on the sand close to, but on the kite's approach they only take a surreptitious snatch now and then. I next notice a solitary Yellow Wagtail (? sp.) and a babbling announces the approach of the band of seven (*M. terricolor*), but they have picked up a waif on the road. They all crowd into a little hollow where a little water lies, and where there is scarcely room for one. Several magpies fly amongst the trees, one or two Drongos (*B. atra*) join the assemblage on the bush, and about 5 P.M., the cicada chorus commences. A white-bellied Drongo (*O. cœrulescens*) next arrives, and as the sun gets very low, three or four green pigeons rattle past. A small hawk dashes past, causing a general stampede. Later on, when all the small birds have gone to roost, this or another small hawk comes to drink. A large red squirrel, as it goes from tree to tree, adds variety to the scene, and just before sunset a number of doves perch in the trees. One or two vultures pick about the carcase with an occasional squabble. A solitary white neophron flies up the nullah, but takes no notice of the carcase: a solitary Roller flies over about 6-15.

"Two vultures which have been exploring the chest cavity of the dead buffalo appear to have found some choice morsel, which they cannot keep secret, for all the other vultures, which had been looking on for about an hour and a half with a great flapping of wings, suddenly join in, and begin tearing the carcase in all places, insomuch that I fear that there will be nothing left for the tiger if he comes. With the last gleams of sunshine the vultures fly off, but a crow keeps on till the last. Monkeys noisily approach, grunting and jumping from tree to tree, or running

on the ground, and the strident call of the peacock re-echoes through the jungle ; a loud shrill-voiced bird repeats its one note, answered by two others in different parts of the jungle ; then more join in.

"Two large owls (?sp.) come and have a drink and a bathe, making a hoarse low whistle. A night-jar flits past with its squeaky note, and later a large yellow thing noisily drops down from the bank and drinks, and I— but what is the use of raking up old sores!

"I should have mentioned that I saw another bird, which I noted as a black drongo-like bird, with erectile crest and a long almost filamentous tail feather, with a widened web at the end. This, I suppose, would be *Dissemorus paradiseus*. What is particularly noticeable in the jungle to the dweller in cantonment is towards evening the number of loud-voiced birds, with peculiar notes ; but I could never manage to get near enough to identify."

I have a note on the 30th May : "I have not noticed any squeaking night-jars lately ; perhaps those which have this call are a particular species ; nor lately have I heard the doves '*put all straight*,' though there are plenty about. I have always been defeated in trying to ascertain what dove is always repeating '*put all straight*.' It may not strike other people, but the words seem as plain to me, as '*Did he do it*' of *Lobivanellus indicus*. I hear '*put all straight*' at all hours of the day and night."

One evening I saw a small hawk, about the size of a merlin, but which I could not identify, flying off with some bird almost as large as itself, which turned out to be the Golden-backed Woodpecker (*B. aurantius*).

I saw many sambur during May, but they had all shed their horns ; there were plenty of horned cheetul. The Barking or Rib-faced Deer also appear all to have shed their horns early as April.

Whilst sitting in a *machan*, I frequently experienced the rain, which is alluded to in the "Indian Forester" of October 1878 thus : "An American tree, which also yields a sweet nutritious food, has been much more successful than the *larch*. This is the *Pîthecolobium saman*, a native of Peru, which from its supposed property of inducing local showers is, in that country, known as the 'Rain tree.'" An exact description and explanation of the phenomenon, which gave rise to this name, has only quite recently been given in the columns of the English periodical *Nature* by Dr. Dyer, who quotes from the eminent South American traveller, Mr. Spruce, as follows : "A little after 7 o'clock we came under a lowish spreading tree, from which with a perfectly clear sky overhead a smart rain was falling. A glance upwards showed a multitude of Cicadas sucking the juice of the tender young branches and leaves, and squirting forth slender streams of limpid fluid. We had barely time to note this when we were assailed by swarms of a large black ant, * * * which ants were greedily licking up the fluid as it fell." I am glad that my experience fell short of the ants.

I close this with a small episode, of which the moral is that people should be careful in recording the occurrence of any unusual beast or bird, which is not in the hand. One morning I was taking up a new camp near a jungle tank, and on approaching my camping ground, I passed along a track, through a little long grass, talking to the natives who accompanied me, about where I should camp. After passing this and going on along the edge of the tank for about 200 yards, I happened

to stop and look round, and saw a yellow animal bounding away through some very thin jungle about 400 yards away. I at first thought it was a deer; and I even put my rifle up in a careless sort of way, then I saw a long tail, and my thoughts ran to a neelghai ; the two natives also saw it. We went on, I being rather puzzled at the action and the tail of the beast. Presently, my *chokra* came up (who had been following me at about 200 yards) in an excited state, and said that as he was following me through this bit of grass, about twenty yards from the track, he saw a tiger crouching facing the path. He, naturally, being a servant and not a shikar, shouted out "Bagh," and the tiger went off into the jungle, and this was the beast we saw, and the others, who were behind, saw it as well. The inexplicable part of the business was that neither I, nor the two natives, who were both shikaris, and had seen lots of tigers, identified it as a tiger when we saw it. The only explanation I can offer is that a tiger was the last thing we expected to see, and we had been seeing on the way lots of deer of sorts.

SIMULTANEOUS TWIN PARTURITION OF *BUTHUS AFER*, THE BLACK ROCK SCORPION.

An illustration will be found facing page 69 of this number of the Journal, which has been reproduced from a photograph taken by Mr. F. J. Kingsley. It consists of a common Black Rock Scorpion (*Buthus afer*) preserved by the Rev. Fr. Dreckmann, S. J., in the act of giving birth to two young ones simultaneously.

The Rev. Fr. Dreckmann writes as follows regarding this unique specimen :—

"It was caught with many others in Khandalla, during May, 1886, and was afterwards brought down to Bombay. They did not, however, survive their capture very long, but in a few months all succumbed to voluntary starvation. They were tempted with different kinds of food, but all to no avail, only now and then they would feast upon one of their number, and when the young ones appeared they were most greedily devoured by their elders. About the middle of June the young ones began to make their appearance. As soon as they were born they climbed upon the backs of their mothers, probably to be out of reach of her jaws, and it was noticed *that the increase of the family was always by pairs.* A closer examination settled beyond doubt two points : 1st, that at least this kind of scorpion is strictly viviparous, not ovo-viviparous, as stated by Duncan ("Transformation of Insects") and others ; and, 2nd, that the birth of the pair *takes place simultaneously*, though very often one of the twins would be somewhat in advance of the other. The specimen presented to the Society was placed in alcohol and killed during the process of parturition, so as to be in evidence about the two points in question.

"Last May we were unfortunate, as all our scorpions died before any young ones were born; this year, however, Rev. Father Meyer, whose special pets they are, intends to take great care of them, and hopes to rear a sufficient number to be able to study their life-history, about which very little appears to be known.

"I have seen it stated that scorpions are such savage creatures that they are bound to lead a strictly solitary life, as the stronger one of two scorpions would invariably kill and eat the weaker one. This is a calumny, I think, as we have often found as many as 16 (two old ones and fourteen half-grown) under one stone, and as 14 was also the greatest number of young ones born by any one female in captivity, the presumption is that those 16 represented an undivided family."

Many writers on the subject refer to the double oviducts, which are apparent on dissection, but the Rev. Fr. Dreckmann appears to have been the first to notice and record the remarkable *simultaneous twin parturition* of this species of scorpion. The subject is one of the greatest interest, not only for the naturalist, but to the physiologist, and it is to be hoped that other members of this Society will contribute the result of their observations.

Mr. Lionel de Nicéville, F. E. S., has obtained from Mr. J. Wood-Mason, the Superintendent of the Indian Museum, Calcutta, the following interesting note on the simultaneous viviparous twin parturition of the Black Rock Scorpion :—

"Nothing, so far as I know or can discover, having been placed on record about the parturition of scorpions, I cannot say whether the twin births you have observed are usual or unusual. Such a point indeed is only to be settled by a multitude of observations of the same kind as that which you are about to record; but whether they are the rule or only occasionally happen, would be readily explained by the bilateral symmetry of the genital organs, by the development of the embryos in pairs, and by the symmetrical action of the muscular mechanism of parturition. That scorpions bring forth living young, and do not lay eggs, has been, I need hardly say, long (more than fifty years) known to science."

CORRESPONDENCE.

THE PROTECTION OF GAME.

The President of the Ahmedabad Municipality having asked the Bombay Natural History Society for an opinion as to what game birds and animals should be protected in the neighbourhood of Ahmedabad, under Act 20 of 1887, the following answer has been sent in reply :—

From the Honorary Secretary, Natural History Society, Bombay ;
To the President, Ahmedabad Municipality.

Bombay, 28th April, 1888.

Dear Sir,— I duly received your letter No. 248 of 3rd inst., and have laid the same before the Committee of the Society, who have expressed their opinion that any Act for the local protection of game, *in order to be effective, should be as simple as possible*.

They are of opinion that game in the neighbourhood of Ahmedabad would be sufficiently protected if it were made illegal for any one (not being a cultivator) to be in possession of game, living or dead, between the 15*th of June* and the 15*th of October* (unless, of course, the possessor could prove that it came into his keeping prior to the 15th June).

An exception should be made in favour of cultivators of the soil, who might be allowed to kill such animals and birds as are destructive to crops; but game so destroyed should not be offered for sale.

I attach a list of the game birds and animals which, in the opinion of the Committee, should be protected You will observe that the Grey Partridge and Grouse have been included in this list, although they both breed much earlier.

The above is the opinion of the Committee of the Society as regards the preservation of *game*, but I am requested to add that, as naturalists, the Committee would be glad to see *all birds* protected during the rains (*i. e.*, 15th June to 15th October).—Yours, &c.,

H. M. Phipson,
Honorary Secretary.

LIST OF GAME BIRDS AND ANIMALS.

Name.	Time of Breeding.	Remarks.
Grouse	Cold weather principally ...	Grouse of sorts.
Bustard	July to September	.....
Florican	July to October	.....
Grey Partridge	January to April, August and September	.....
Painted Partridge	August to October	.....
Quail	July to October	Quail of sorts.
Pea Fowl	Do.	.....
Ducks	August to October	(Non-migratory ducks.)
Jungle Fowl.....	May to July	.....
Spur Fowl	Do.	.....
Hares	At all seasons	.....
Antelopes (*i. e*, Nylghai, Black Buck, Chinkara, Bekri, &c)	Principally during the rains.	.....
Deer, (Sambur, Chital, &c).	Do.	.....

PROCEEDINGS OF THE SOCIETY.

PROCEEDINGS OF THE MEETING OF 4TH JANUARY, 1888.

THE usual monthly Meeting of the Members of the Society took place on Wednesday, the 4th January, and was largely attended. Dr. D. MacDonald presided.

The following new members were elected :—Mr. E. Giles, Captain K. Macaulay, Mr. Henry J. Eunson, C.E., Mr. G. C. McMullen, Mr. Shripad Babajee Thakur, C.S., Dr. D. A. DeMonte, Colonel C. E. Hussey, Mr. A. F. Appleton, A.V.D., Mr. C. E. Crawley, and Mr. J. C. Parker.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged receipt of the following contributions to the Society's collections :—

CONTRIBUTIONS IN DECEMBER 1887.

Contributions.	Description.	Contributor.
A quantity of Shells and Corallines.	From Alibag	Mr. W. F. Sinclair, C.S.
1 Snake.....	Bungarus arcuatus	Mr. A. E. Tittle.
1 Monitor (alive).....	Varanus dracæna	Mr. Sitaram V. Sukthankar.
2 English Pheasants and 1 Woodcock.....	Mounted.....	Mr. J. C. Anderson.
2 Ostrich's Eggs	Struthio camelus	Mr. G. C. McMullen.
1 Crocodile (alive)	Crocodilus palustris	Dr. L. B. Dhargalker.
1 Civit Cat (alive)	Viverra civettina	Mr. Percy Benn.
1 Hedgehog	Erinaceus collaris	Rev. J. Abbott.
Skin of the large Tiger Cat,	Felis viverrina	Mr. H. T. Ommaney, C.S.
1 Snake	Trimeresurus anamallensis.	Mr. F. Gleadow.
1 Owl (alive)	Strix javanica	Mr. H. Littledale.
21 Birds' Eggs.....	From Baroda...	Mr. H. Littledale.
1 Snake	Daboia elegans	Mr. Lang.
2 Snakes (alive)	Ptyas mucosus	Dr. D. DeMonte.
1 Snake Bird	Plotus melanogaster	H. E. Lady Reay.
1 Turtle (alive)	Chelonia virgata	Dr. J. F. Gonsalves.

Mr. N. S. Symons exhibited two mounted mahseer (*Barbus tor*) caught by him in the Bowani River, in 1886, which weighed 72½ lbs., and 65½ lbs. respectively.

The Honorary Secretary gave notice that at the February meeting the committee would propose that all persons joining the Society after the 1st March next be charged an entrance fee of Rs. 10.

Dr. G. A. Maconachie was re-elected a Vice-President of the Society.

Contributions to the Library.

Prachin Sodhsangrah, from H. H. Maharajah of Bhownugger. *The Ibis*, 1873 to 1878, Messrs. Thacker & Co. *Proceedings of the Zoological Society*, 1878 to 1885, Messrs. Thacker & Co. *Flora of British India* (Hooker), Part XIV., Bombay Government. *List of the Birds of India* (Hume), Mr. Frank Rose. *The Journal of Medicine*, No. 96-8, from Dr. T. L. Phipson.

Dr. D. MacDonald exhibited a curiously deformed fœtus of a domestic cat.

Proceedings of the Meeting held on 6th February, 1888.

The usual monthly meeting of the Members of the Society took place on Monday the 6th February, Dr. D. MacDonald presiding.

The following new members were elected:—Brigadier-General Pottinger, Mr. D. McLauchlan Slater, Mr. E. Freeborn, Colonel J. Hibbert, Mr. C. N. Clifton, C. E., Mr. G. P. Robinson, Lieut. D. Madhowrao, N.A., Dr. Shantaram Vinayak Kantak, Mr. Dady Hormusjee C. Dadysett, Captain H. S. B. Hodgkinson, Mrs. Pearson, Mr. Furdoonjee Jamsetjee, Mr. J. S. Mure, Mr. D. A. Glazebrook, Mr. H. Chalmers, Mr. H. R. Cobbold, and Mr. Bomanjee Eduljee Modi.

The following contributions to the Society's collections were acknowledged:—

Contributions during January.

Contributions	Description.	Contributor.
1 Snake	Simotes Russellii	Miss E. Atkinson.
1 Boar's Skull	Sus indicus	Dr. DeMonte.
1 Snake	Lycodon striatus	Mr. R. A. Sterndale.
1 Dolphin	Delphinus plumbeus	Mr. F. A. Little.
1 Pelican	Pelecanus philippensis	Mrs. Sheppard.
Bark Cloth	From Zanzibar	Mrs. Gallagher.
1 Spotted Owlet (alive)	Carine brama	Mr. P. R. Valladares.
1 Freshwater Fish (weighing 74 lbs)	Bagarius Yarrellii	Dr. A. Stewart.
1 Marbled Teal	Querquedula angustirostris	Mr. J. D. Inverarity.
1 Oryx's Head	From Somali Coast	Capt. W. G. Forbes.
1 Crocodile	Crocodilus palustris	Dr. DeMonte.
Egg of the Indian Bustard.	Eupodotis Edwardii	Mrs. Pearson.
1 Chameleon	Chamæleo vulgaris	Mr. S. A. Bulkley.
1 Crocodile's Head	Crocodilus palustris	Mr. A. R. M. Simkins.
1 Wood Snipe	Gallinago nemoricola	Mr. T. R. Bell.
1 Fish (mounted) 40 lbs.	Barbus Malabaricus	Mr. H. M. Phipson.
1 Owl (alive)	Strix javanica	Mr. H. Littledale.

Minor Contributions, from Dr. Weir, Mr. G. Carstensen, and Mr. Strong.

Contributions to the Library.—Proceedings, Linnæan Society of N. S. Wales, Vol. II., part 3; Records of the Geological Survey of India, Vol XX., part 4; Comparative Anatomy of Vertebrates (Owen), Mr. J. Westlake; Catalogue of the Moths of India (Cotes and Swinhoe), Verhandlung der Zoologisch Botanischen Gesellschaft in Wein, Vol. XXXVII., Nos. 3 and 4.

Mr. H. M. Phipson announced that the following books had been deposited in the Society's Library by him on loan for the use of the members :—

The Rod in India (Thomas).
The Thanatophidia of India (Fayrer).
Malabar Fishes (Day).
Natural History, Reptiles (Wood).
Insects Abroad (Wood).
The Aurelian (Harris).
Pro. Zoo. Society, January to June, 1887.
Utilization of Minute Life (Phipson).
Malay Archipelago (Wallace).
The Sportsman's Handbook (Ward).
Transformation of Insects (Duncan).
Animals and Plants under Domestication (Darwin).
General Structure of the Animal Kingdom (Rymer Jones). Wild Animals (Fortuné Nott.)
A Naturalist's Rambles in China Seas (Collingwood).
History of Mammalia.
Handbook of Cashmere (Ince).
Fish and Fishing (Manley).
Chapters on Evolution (Wilson).
Siberia in Europe (Seebohn).
The Student's Darwin (Aveling).
Notes on Collecting (Taylor).
Studies in Animal Life (G. H. Lewes).
Game Birds of India (Jerdon).
Animal Creation (Rymer Jones).
Animal Locomotion (Pettigrew).
Destruction of Life by Snakes in India.
Beetles (Duncan).
Matheran Hill (Smith).

Mr. H. M. Phipson exhibited a fine specimen of the Malabar carp (*Barbus Malabaricus*), which weighed about 40lbs. It was caught by him near Poona in December last, and had since been mounted by him for the Society's collection.

Mr. E. L. Barton exhibited several heads of deer, wild cat and monkey mounted by him for members.

The accounts for the year 1887 were then submitted and explained to the meeting by the Honorary Treasurer, Mr. E. M. Slater, from which it appeared that the balance at the Bank of Bombay on 31st December last was Rs. 688-13. It was resolved that the accounts be passed.

The following resolution was then proposed by the Chairman, seconded by Mr. J. H. Steel, and carried unanimously :—"That in future an entrance fee of Rs. 10 be charged to all persons joining this Society."

PROCEEDINGS OF THE MEETING HELD ON 5TH MARCH 1888.

THE usual monthly Meeting of this Society took place on Monday, the 5th March. Dr. D. MacDonald presiding. Mr. T. D. Mackenzie, C.S., was elected a member.

The Honorary Secretary then acknowledged the following contributions :—

CONTRIBUTIONS DURING FEBRUARY.

Contribution.	Description.	Contributor.
1 Bees' Comb	From Aurungabad	Mr. Frank Rose.
1 Bittern	Botaurus stellaris	Mr. J. D. Inverarity.
2 Snakes (alive)	Echis carinata	Mr. H. M. Phipson.
A quantity of Barnacles ...	Mounted	Captain Dixon.
Orchid Bulbs	From Surat	Mr. F. Gleadow.
A number of Beetles	From Zanzibar.....	Rev. Etienne Baur.
20 Snakes	From Sikkim	Mr. Paul Möwis.
Eggs of Rock Horned Owl.	Bubo bengalensis	Mr. J. L. Lushington.
1 Grey-breasted Tragopan (alive).	Ceriornis blythi	Mr. F. Mercer.
2 Flying Squirrels	Pteromys oral and another	Mr. R. A. Straw.
1 Jungle Cat	Felis chaus	Do.
2 Snakes	Echis carinata	Mr. H. Buckland.
1 Chameleon	Chamæleo vulgaris	Mr. P. Reynolds, C.E.
4 Musk Deer's Skulls	From Cashmere	Mr. E. L. Barton.
1 Jackal's Skull	Canis aureus	Do.
1 Fox's Skull	Vulpes bengalensis	Do.
1 Albino Parrot.....	.....	Rev. E. S. Hall.
1 Otter's Skull	Lutra nair.....	Mr. G. P. Millet, C.S.

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UNSCIENTIFIC NOTES ON THE TIGER.

By J. D. Inverarity.

(Read at the Society's Meeting on 9th April, 1888.)

The title of this paper will have given you notice that I do not make any pretensions to the learned and scientific attainments of the gentlemen who have instructed and amused us by the able papers hitherto read at our monthly meetings. One of the chief pleasures of shikaring, to my mind, is the observation of the manners and customs of the animals one pursues. I keep a journal when in the jungle, so I have been able to correct my memory by reference to notes made at the time. When I was looking up materials for this paper, I was surprised to find how many small but valuable details I should have forgotten without the aid of my journal. I meant to have astonished you with some exceptionally large tigers, but as my notes show them to have been considerably smaller than I should have imagined, if trusting to memory alone, I am unable to do so. In fact, I find that I have never killed or seen killed a tiger that measured so much as 10 feet. The size of tigers gives rise from time to time to animated discussions in sporting books and in sporting newspapers, some maintaining that tigers of 11, 12 or even 14 feet have been slain, others fixing about $10\frac{1}{2}$ feet as the limit. The accepted mode of measurement is to run the tape from

the tip of the nose to the end of the tail, as the tiger lies on his side on the ground, following the curves of the body. If this method is fairly adopted, a tiger in Western India or the Central Provinces of over 10 feet will be found to be very uncommon. A large number of adult tigers will be found to be under 9 feet, and I think myself that the majority of tigers are under 9 feet 6 inches. The largest tigress, in my own experience, measured 9 feet 1 inch: they usually measure about 8½ feet. There very probably is an occasional Chang among tigers of abnormal size, which may account for some of the exceptional measurements one reads about. If, however, one measures out 12 feet on the wall of a room and sketches in a tiger in the space measured out, one realizes that a 12-foot tiger would astonish one. Colonel Peyton, who had a very long experience in the Canara forests, mentions in his very interesting article on Tigers in Vol. 15 of the *Bombay Gazetteer* only five being shot in Canara over 10 feet, the largest being 10 feet 2½ inches. Mr. Mulock, of the Bombay Civil Service, who has been at the death of as many tigers as any one on this side of India, tells me that to the best of his recollection he has only seen one or two over 10 feet. Mr. Sanderson in his book gives 9 feet 6 inches as the largest he killed. Captain Forsyth mentions, I think, only two over 10 feet. The usual mode of arriving at the size of tigers, though convenient, and giving one a fair general idea, is sometimes deceptive, owing to the tail (which is included in the measurement), varying in length in different animals, so that a stoutly built tiger with a short tail does not have justice done to him. The skull tells you at once whether the tiger was a large or small one. Mr. Sterndale, in his "Mammals of India," has elaborate calculations showing from the measurement of the skull what length the tiger who owned the skull ought to have been. I have here the skulls of three tigresses which measured 8 feet 9 inches, 8 feet 6 inches, and 8 feet 5 inches, respectively. You will notice that there is hardly any difference in the size or general character of the skulls. Here is the skull of a 9 feet 1 inch tiger which is much bigger in every way. The skull and frame of a tiger would, however, always be larger and stouter built than a tigress of the same length. Here is the skull of an 8 feet 9 inches tiger. Compare it with the skull of the 8 feet 9 inches tigress, and you will see the difference.

Tigers are supposed to breed only once in three years, which is unsatisfactory intelligence for the sportsman. The only reason for

this is that their cubs stay with the mother till they are about two years old; so if the tigress should lose her cubs she would, no doubt, breed again sooner. The period of gestation is said to be thirteen weeks: from two to four cubs are usually brought forth. A litter of five cubs is said by Colonel Peyton (*ubi supra*) to be not uncommon. The late Major Neill, of the Central India Horse, told me of one case in his own experience of six unborn cubs being found in a tigress that was shot. The tigress, however, rarely rears to maturity more than two cubs, and sometimes only one. I have never seen myself a tigress accompanied by more than two well-grown cubs, nor have I seen tracks of a larger number with their mother. Col. Peyton (*ubi supra*) mentions three instances of tigresses having been shot in Canara, when accompanied by a well-grown family of five, and I have heard of more than one authentic instance of four cubs coming out in a beat with their parent. The cubs remain with their mother until they are about two years old. There is no particular breeding season, as young cubs have been found at all periods of the year; but I believe that most of the cubs are born from February to May. I daresay my belief is wrong, but it is based on the age of cubs one sees in the hot weather, the size of their tracks one sees then, and the likelihood that they would be born at a time of the year when the food of the mother is more easily procurable. In the months of March, April, and May the water supply of a country is much diminished, and the deer and hog, which are the natural food of the tiger, necessarily congregate where the water remains, and are not so widely scattered as they are at other seasons; and it follows that the tigress has then less trouble in hunting for her prey than she otherwise would have. Wild animals and birds in Europe are born and hatched at a season when a plentiful supply of their food is produced by Mother Nature. I am not sure, however, that this holds good in the East, where there is no severe cold climate or winter to contend with.

No one seems to know to what age a tiger will live. Individual tigers are well-known to the native shikaris, who have, however, no idea of time as measured by years. They don't know their own ages, and no reliance can be placed upon their accuracy in anything relating to time. The only reliable information I have on the subject is from Colonel J. Hills, of the Engineers, who informed me that he shot a tiger that had been wounded by the district officer of the time, sixteen years before, by an Enfield bullet in the neck.

The bullet was found by Colonel Hills still in the animal. This tiger had one foot smaller than the others, and so his tracks could always be easily identified. He was an adult tiger when hit with the Enfield bullet, and so must, at any rate, have been 19 or 20 years old when shot by Colonel Hills. What is the weight of a tiger I have no personal knowledge. Some years ago, in *The Field*, the weight of a 9 feet 8 inches tiger was given as 355 lbs., and of a 9 feet tigress as 235 lbs., from actual weighments, which is about 25 stone for a tiger and about 17 stone for the lady. Mr. Sanderson, in his delightful and accurate book "Thirteen Years among the Wild Beasts of India," says a very bulky well-fed male weighed by him was 349½ lbs. Captain Forsyth, in his "Highlands of Central India," one of the best written books about Indian sport, says that the ordinary tiger weighs 450 or 500 lbs., and that one he shot must have touched 700 lbs. at least. This animal, however, was not weighed. I believe that the majority of tigers are under 350 lbs. I judge, however, entirely from comparison with other animals, such as deer, the approximate weight of which is known to me. It is well known that a tigress teaches her cubs to kill by disabling the animal attacked, so that it cannot escape from the onslaughts of the cubs. Two years ago, I came on an instance of this where the kill was an old bull nilghai, who had been wending his way down a shallow nullah to a water hole. The tigress had been lying in wait about twenty yards from the water behind the stump of a dead tree; there was no cover where she lay; her seat was easily seen in the sandy soil. She had two cubs, about ten months old, with her, but there were no signs of their having lain near her, so, I presume, they were hidden in the jungle until the proper time came. The nilghai had passed within three yards of the tigress, who had rushed out and seized him by the right foreleg just below the shoulder, breaking the bone. The cubs then, I think, had joined in and killed by tearing at the flanks and disembowelling the poor brute. I was out stalking and came on the spot by chance, about 9 A. M. Both hind quarters of the nilghai had been completely eaten. There were no marks on the neck or forequarters except the one grip of the tigress on the right leg. It had been eaten on the spot where it was killed. I took a photograph of the nilghai. You will see there is no mark on the throat, the usual place of seizing. The face of the animal has also a peculiar painful expression, which one never sees on an ordinary kill. The branch of a tree that you

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see in the photograph lying almost across the kill was freshly broken off a tree on the bank of the nullah. It appeared to me that after eating the tigress had ascended the bank and reared herself up on her hind legs, resting her forequarters on the branch, which broke with the weight. The tigress and two cubs were sitting close by in the water hole, and gave vent to a series of growls as I approached, but finding I was not intimidated, sneaked off up a kind of ditch overgrown with grass without my seeing them, although I was within fifteen yards. They returned to the nilghai the next night, and finished it. I have here a photograph of the nilghai after the second night. You will see nothing is left except the head, bones of the legs, ribs, and some skin. You will also perceive from the surroundings that the carcase had been dragged to another spot before being eaten. I also returned at daylight, but the tigers had then left. I shot the tigress late in the afternoon. She vomited up large strips of the nilghai's skin in a perfect state, not digested at all, and as I shot her at least twelve hours after she had been eating, it appears that skin is not easily digested. One of the cubs, about the size of a panther, was also killed; the other escaped. Only last week when out stalking in the Easter holidays, I found the carcase of an old bull nilghai that had escaped from a tiger, but died of the wounds inflicted on it, probably from blood-poisoning. It had been dead about a day. The tiger had seized it by the hind leg immediately above the hock, hamstringing the leg. He had also bitten through the other hind leg in the same place, but had not hamstrung this leg. The nilghai had somehow got away. I could not find any other marks of the tiger on it, although there had probably been some scratches with the claws, as the vultures had made a few holes where the skin had, no doubt, been gashed. The holes made by the tiger's teeth were full of maggots, bred while the animal was alive, the rest of the carcase being comparatively fresh. I took a photograph of the hind leg, which shows clearly the teeth marks immediately above the hock. You will see they are too large and too wide apart to have been caused by a panther. The large hole shown in the picture in the thick part of the leg had been made by vultures, of which there were many sitting about waiting until decomposition had proceeded far enough to enable them to get through the tough skin. I fancy this tiger must have been a young inexperienced one, or the nilghai would not have got away. Opinions differ as to the

mode in which a tiger usually kills his prey. Some say that he seizes by the throat, others by the nape of the neck from above. I have examined scores of kills with special reference to this point, and in every case (except one) the throat had been seized from below. The exception was an old boar that had been seized by the back of the neck from above. I also once came across a man that had been seized by a man-eater by the nape of the neck. Strange to say he recovered. He was the last of a single file of several villagers, and on the tiger seizing him, his comrades turned and drove the tiger off him. He was insensible, and had no idea when he came to his senses what had happened to him. He eventually recovered. The victim being seized, all authorities agree that the neck is dislocated by a wrench. I have never been able to understand how this dislocation takes place. A wrench, one would suppose, would throw the animal over before dislocation could occur. I have always doubted whether dislocation does take place. I have never noticed any external appearance of it, but I don't place much reliance upon that, as the body is generally stiff before one gets to it. Actual dissection, which one is not usually inclined for under a hot sun, I have never tried. The hunting leopard (the tame one) appears to me to kill by simple pressure on the windpipe; for the ones I saw did not even break the skin with their teeth, and I don't see why a tiger should not kill by that means. If any of you will get a friend to clutch your windpipe with even moderate violence, you will find it renders you quite powerless. It is by pressure on the windpipe that garotters succeed, I have always understood. On the other hand, I have seen more than one instance where adult tigers and panthers having seized have failed to kill, when they have had it all their own way, and not been frightened off. This I cannot account for, as the wounds in the throat in such cases have appeared to be the usual ones. It is only by accident, if at all, that tigers in killing sever any important vein or artery. The natives will tell you that they do and suck the blood. I have never found any blood to speak of that has flowed from the throat wounds. I once heard a tiger take a bullock out of a herd within 300 yards of me and was on the spot immediately. The tiger had sneaked off, either frightened by the shouts of the herdsman, or because he heard me. The bullock was dead. Hardly any blood flowed from the wounds, which were in the usual place in the throat. Very large and powerful animals,

like the bull bison and bull buffalo if attacked at all, are, I think, in the first instance, attacked from the rear with a view to disable them. A few years ago I shot a very large solitary bull buffalo that had been attacked by a tiger in this way a short time before. The tiger had leapt on his quarters, fixing his claws on both sides of the root of the tail, and also fastening on with his teeth. There were long cuts down both hind legs made with the claws. The wounds were healing well, and the buffalo was none the worse. Having killed, the tiger invariably according to my experience (though some writers say he occasionally begins elsewhere), begins eating at the hind quarter. Why he should do so I don't know. He polishes off one hind quarter, and generally both. Sometimes he leaves the stomach and intestines in *statu quo*. Sometimes he will remove the stomach and make a neat parcel of it a little on one side. If a tiger and a tigress are together when they kill, they finish an ordinary-sized animal at one meal, leaving only the head. In such a case, I fancy the second one eats at the fore quarter. I have a photograph here of a bullock killed and partly eaten by two panthers. One, you see, has eaten at the hind, and the other at the fore quarters; and it is probable that tigers would do the same. On the other hand, the tigress and cubs, I told you of, all ate at the hind quarters of the nilghai. Here is a photograph of a wild buffalo calf, killed and partly eaten by a tiger; also one of a larger but tame buffalo similarly treated.

These will give you a good idea of the appearance of the dinner after the tiger's first meal. The latter photo. also clearly shows the tiger's grip on the throat when killing. With the exception of the nilghai previously mentioned, I have never seen an animal eaten where it was killed. It is always dragged a short distance, and sometimes for a considerable way, before the eating begins. It is dragged, not lifted clear off the grouud. Having gorged himself, he sometimes lies up close to the kill, but as often as not, especially in the hot weather, if there are hills anywhere about, he will go a long distance from the kill before he lies up for the day. I think the reason is that in the hot weather he prefers to get into some cave, or to lie out high up on a hill side under some shady tree where he gets the breeze, rather than stop in the close hot atmosphere of low jungle. At any rate, I have frequently found them pass through very likely looking heavy jungle near the kill, and proceed long distances to hills before lying up. As a general rule, the tiger

returns to his kill the next night as soon as it is quite dark. He then finishes what is left if the kill is an ordinary bullock or deer. He never eats at the place he ate the night before, but drags it forty or fifty yards before beginning operations. If you sit up over a kill it is necessary to tie it by the fore leg to a tree, otherwise the tiger will walk off with it as soon as he arrives. This occurred to me sitting over a natural kill of a boar. The tiger picked it up and walked off without stopping a second. If you tie it, the tiger does not seem to mind, but will stop and eat. He takes about two hours steady eating to finish the forequarters of a bullock. I timed a small tigress two years ago. She came and ate for ten minutes and then went away for twenty minutes, I think to have a drink. She returned and ate without stopping for two-and-a-quarter hours. Just as the moon was getting up, she finished, and walked quietly off. Though I was within ten yards, the whole time up in a tree, I could not see at all, so did not fire. It is no use firing a random shot on these occasions. You probably only wound or miss, altogether frightening the animal out of the country. A little self-control and patience will give you a better chance another day. This particular tigress I turned out in a beat next day, but did not get a shot.

Tigers on occasions are cannibals. The male is said by the natives, probably with truth, to kill and eat the cubs. Mr. Mulock once fired at a tiger, and shortly afterwards fired at what he supposed to be the same tiger. He killed them both, but thought he had only killed one; and so one was left dead in the jungle. A third tiger came during the night and had dinner off it. This tiger also returned the next night, and had another meal. I have a photo. here of the tiger so eaten. I have read of other instances of tigers eating the dead carcase of one of their own kind, but have not seen any such instance myself. They will also eat the dead carcase of an animal they have not themselves killed. Mr. Raitt, of the Bombay Uncovenanted Service, was killed by a tiger that the evening before had fed on the body of a bear that Raitt had shot. Tigers are supposed to kill once in five or six days, and this; no doubt, is generally the case, as a tiger does not trouble himself to hunt much for a few days after a heavy feed; but if they get the chance, they will kill whenever they can. A tigress I was after last year killed, on three consecutive nights in different places, never returning to the kill. Some years ago a tigress killed on fourteen consecutive nights. She returned to the same place every night, and found a fresh bullock

tied up in the place of her old kill. We were engaged with other tigers some distance off, hence the necessity of keeping her in the neighbourhood till we arrived. There is no real cruelty in tying out baits for tigers. At any rate, few tigers would be killed without baits, and the one sacrificed saves the lives of all the other animals that the tiger would kill if he was not shot. So on the principle of the greatest happiness of the greatest numbers, tying out would be justifiable. But I also believe that animals killed by a tiger suffer little, if anything, beyond an instinctive panic for a few seconds. Dr. Livingstone has recorded in his travels in South Africa, that when he was seized by a lion, the shock produced a stupor and dreaminess in which there was no sense of pain or feeling of terror, though conscious of all that was happening, and he expresses his opinion that this peculiar state is produced in all animals killed by the carnivora, and is a merciful provision of our Creator for lessening the pain of death. I have conversed with both Europeans and natives who have been boned by tigers and panthers, and they all confirm this view. Animals, until the moment the tiger arrives, are unconscious of their fate, and the probability is that Dr. Livingstone's opinion is well founded; that at the moment of attack they get stupified and insensible to fear or pain. I once saw a bullock in a beat lie down and stretch his neck out flat on the ground, as if for concealment when the tiger approached. After the tiger had been shot, the bullock rose and began grazing. I am inclined to think that the fear of the bullock in this case was caused as much by the noise of the beat as by the presence of the tiger. A tiger sometimes kills immediately after having fed if he comes across a fresh bullock. Last year I shot a tigress that had first killed a stray bullock, about three hundred yards from one of my ties-up. Having eaten the hind quarters, the tracks led to the tie-up. This she killed and dragged away into an adjacent hill. On another occasion, after eating the tie-up, a tiger killed five buffalo calves, out of a herd of eight calves that had strayed near. They all lay close together within a space of twenty yards, and not more than 200 yards from where the tiger had been eating. All of them had been seized by the throat, and were otherwise uninjured. It is possible that the tiger in this case had been disturbed by the calves coming near where he was eating, and being annoyed, had sallied forth and killed them. But I do not think so, as I could not find any tracks returning to the kill.

Vultures take good care not to descend on a kill if the tiger is near. They perch on the trees above, and one is often led to a kill by seeing them. If they do descend on the kill, the tiger kills them if he catches them. One I found so killed seemed to have been caught and crushed with the paw. The "sledge hammer stroke of the fore paw of the tiger" one reads about, I have never come across. No kill I have ever seen bore any marks of it. Four men have been seized by tigers either in my immediate presence or when I was close by. In every case the tiger clutched them with his claws, exactly as you might clutch a person's arm with your fingers; and there was no sign of a blow further than you would expect from a violent seizure. Tigers wander immense distances during the night. They are very partial to easy going, and if there are any tigers about, one of the best places to look for their track is along the jungle roads and footpaths, to which they will sometimes keep for miles. They also roll in the dust of the roads, and take a dust bath. They don't like moving in the heat of the day; the hot ground burns the pads off their feet, and makes them quite raw. A wounded tiger I followed a whole day, had the thick leather pad of his paws completely removed from this cause, two days after he was first wounded in the hind legs. This tiger killed a bullock, and made a good meal; when shot his feet were in the state described. They are also fond of sitting in pools of water in the heat of the day. I have three times found them enjoying a cool bath. Tigers seldom climb trees. I have a photograph here of a tree in Salsette that was climbed by a man-eater. He attacked two men, one went up this tree to the fork of the right hand branch, the other escaped. The tiger went up the tree, but could not quite get to the fork where the man was. He then came down and hid in the jungle near. Poor Pandoo, for such was his name, thinking the coast was clear, descended and made tracks for his village, no doubt congratulating himself on his escape, when the tiger seized him and ate him. The inquest report stated "that Pandoo died of the tiger eating him; there was no other cause of death. Nothing was left except some fingers, which probably belonged to the right or left hand." Such was the inquest report. The above facts were stated to me by my friend Mr. Mulock, who took the photo. of the tree I have shown you. It seems extraordinary that the remains of Pandoo did not consist of more than some fingers, but I tell the tale as it was told to me.

You would think that a tiger was a conspicuous object in the jungle, but the contrary is the case. His yellow skin blends with the colours of the dried-up grass, and the black stripes correspond with the flickering shadows thrown by the stems of the grass, leaves and branches of the trees, so that when the animal is motionless, it is almost impossible to see it. The real danger of following a wounded tiger on foot is the difficulty of seeing the brute in time for action.

Darwin is inclined to attribute the handsome appearance of the tiger to sexual selection, and considers the theory that its colour is intended as a means of concealment unsatisfactory, and he instances the zebra (who lives on open plains) as an animal, whose stripes can be of no use for that purpose. It is, however, certain that every wild animal, however conspicuous its colours and appearance may be when seen in Zoological gardens, is extremely difficult to make out when motionless in its native wilds; and I have little doubt that a zebra on his native plains would be found not to be so visible an object as at first sight might seem to be the case. At all events, if a tiger remains perfectly still, the odds are you will walk right up to him without seeing him. The younger tigers are handsomer than the older ones; the coats of the latter are less vivid in colour and have a faded appearance.

Natives have many pleasing delusions about tigers. They believe that the ghosts of a man-eater's victims ride on his head, warn him of danger, and point the way to fresh victims; and, in one instance I heard of where a shikaree had been killed by a man-eater, the general opinion was it was no use to try for the tiger, as the ghost of the shikaree was up to all the dodges and would infallibly warn the tiger. They also think that you get the courage of the tiger by eating its flesh; that unless the whiskers are singed off, the spirit of the tiger will haunt you, or (as I read in an old book) you will be turned yourself into a tiger in the next world; that the fat of a tiger is a specific for rheumatism, that the number of lobes in the liver correspond with the number of years the tiger has lived, that the claws if worn are a charm against the evil eye. The small bone embedded in the muscles between the shoulder and neck of a tiger is also a charm. This bone is a rudimentary clavicle or collar-bone.

In some places, too, there is a superstition that God allows the tiger one rupee a day for his food, so that if he kills a bullock worth Rs. 5, he won't kill again for five days. If it is worth Rs. 10 he won't kill again for ten days, and so forth. I have also read that

the possessor of the whiskers of a tiger obtains unlimited power over the opposite sex, but I cannot from personal experience vouch for the truth of this statement. I will now wind up this rather desultory paper by showing you the photo. of two tigers with their skins taken off. My lady friends tell me this is a nasty one, but nasty or not, it gives you a very good idea of the immense muscular power of a tiger's forearm, and reminds one of the saying that beauty is only skin deep.

NOTES ON THE ORIGIN OF THE BELIEF IN THE BIS-COBRA.

By J. A. Da Gama, L.M., K.C.J.C.

(*Read at the Society's Meeting on 7th May*, 1888.)

I had the pleasure some time since to listen in these rooms to a very interesting paper by Mr. Vidal on the *Bis-cobra*. Mr. Vidal, supposing that the *Bis-cobra* belonged to some one of the lizard families, and that it was a very poisonous lizard, or, according to some, that it was twice as poisonous as the Cobra-de-Capello, says that such an animal as the *Bis-cobra* never existed, because there has not yet been found a poisonous lizard in India. The more one studies the subject on the lines Mr. Vidal takes, the more one feels inclined to yield to the belief that there never has been such an animal in existence, and the descriptions given of it by the natives are a myth. But looking at the subject in a different light, I think that there exists an animal which, in the 16th century, had the name of *Bis-cobra*, but which subsequently came to be known, both scientifically and popularly, by other names, and which is neither a cobra nor a lizard.

When we desire to verify accounts of facts sent down to posterity by tradition, we should not criticise them merely through the improved means of investigation which have been placed in our hands by recent discoveries. It is necessary to transport ourselves to that period of time, when those facts are supposed to have occurred, and we should examine them by having regard to the amount of the information which was available to the people then living, and to various other circumstances which probably may have influenced the

result of their enquiries. You all know what treatment Galileo received for having ascertained the earth's movement. If we were to judge of the result arrived at then through our present knowledge of astronomical subjects, we should be astonished at the condemnation of Galileo by the Inquisitors at Rome for his discovery, which forms the basis of all the astronomical calculations of the present day. But then we must remember that the fact occurred in the year 1615, when superstition and religious autocracy reigned supreme. History has sent down to us accounts of facts which were exaggerated according to the feelings and ways of observation of the writers who wrote when those facts occurred, or were supposed to have occurred. Cobra-de-Capello itself had once been fabulously described and painted in Italy with more hairs on its body than a bear has. Capello in the Italian language means hair and a hood as well. In giving the description of the cobra, the writer, who had never seen a Cobra-de-Capello before, said that it had long, thick and grizzly hair, and illustrated it so. Had not that impression about the cobra been corrected by subsequent travellers in the East, Europeans would still have believed that the Cobra-de-Capello was a *cobra-bear*.

In order, then, to ascertain the existence of the *Bis-cobra*, we must go back to the period of time at which, so far as we can discover, the term came into use in India, and find out its origin, and the reasons which led to its application to the animal, which was given that name, bearing in mind particularly that the term must have been applied to some animal having something to do with the Cobra. It is by means of this method of enquiry that I intend shortly to examine the origin of the belief that such an animal as the *Bis-cobra* existed.

First as to the origin of the term. The term Bis-cobra is not of Oriental origin. It is simply a Portuguese expression, which seems to have undergone contraction long since by a process, similar to that which the native servants, jugglers, and vendors use now-a-days to contort English phrases.

The term *Bis-cobra* is *Bicho-de-Cobra* contracted.

The word *Cobra* being, in Portuguese, the equivalent of *coluber* and *anguis* in Latin, the earlier Portuguese in India, with whom the use of the word must have commenced, applied it to all sorts of snakes, and some lizards and worms, but their acquaintance with Natural History being very limited, they naturally classified the

animals they met with, but which they had not seen before, according to their most prominent features and appearances. For example, they named the snakes thus ; the *nag*, on account of its hood, they called *Cobra-de-Capello* ; the *gonoos* or the *Daboia*, on account of its beautiful mosaic skin, they named *Cobra-de-Alcatifa*, or carpet snake ; the water snakes they called *Cobras-de-agoa*, and so on : even some of the lizards they called cobras.

Permit me to read to you by way of illustrating the above stated view, namely, that the earlier Portuguese in India classified the animals they saw, according to appearances, the description of Cobra-de-Capello given in his work called "*Oriente Conquistado ao Jesus Christo*," by the Jesuit Father, the Rev. Francisco de Souza. Although this work was published in the year 1710 it had been written previous to the year 1697. It treats of the Portuguese Conquests from the year 1542. I believe that it is the most elaborate and one of the first descriptions of the Cobra-de-Capello ever given at that time, although mention is made of the Cobra by Garcia de Orta, Fathers João Lucena, Daniel Bartoli, Bastian Gonsalves, Fernão Mendes Pinto and others. The despatches from the Portuguese Viceroys and other contemporary authorities and letters from private individuals to their friends also refer to it. The passage, which I translate into English as literally as possible, is as follows :—

"The *Cobra-de-Capello* is so called, because it has a cartilaginous skin on its head, which opens and closes. When it is open, it resembles a monk's hood, and more appropriately a lady with *patas* and *monhos*. [The *patas* and *monhos* were a peculiar head-dress worn at that time by the Portuguese ladies, which spread out on both sides of the face having the concavity forwards.] It is a very ferocious animal. When enraged, it extends its hood, raises half its body from the ground, and throws off such puffs, that with them it kills chickens, hens and middle-sized quadrupeds. Its length is from five to seven spans, and its breadth is proportionate to its length. Its belly is white, the sides yellow and the back of a dark grey with black points. On the open hood there can be seen two perfect SS [*esses*] of a black colour placed side by side. Although it is very fierce, it becomes so charmed at the sound of a juggler's pipe, that it comes out of its hole to enjoy the melody nearer, then the juggler catches it, and shuts it in a basket, and with his tricks so tames it, that he makes it dance along with a rat, but its dancing movements

are limited to moving the upper part of its body from side to side with the open hood, and this at the sound of the pipe and that of a small tambourine, which the country people call 'daça' or 'dak.' On the application of the juice of certain herbs to the nose, it becomes so drowsy that a child seven or eight years old, naked as he is, as I have often seen, takes it in the hand with the greatest ease and confidence, and does what he pleases with it.

"He places it round his neck as a necklace, sometimes across the shoulder, at others around his waist as a belt. Occasionally he puts its head in his mouth, trusting perhaps in the virtues of the herbs he has chewed. The jugglers go about in the villages with these tricks to make their living, but it happens sometimes that the cobra bites them and then it invariably kills them. This Cobra is worshipped by the Gentoos, who always rear it in their pagodas, and some of them rear it in their houses out of devotion; to such kindness the cobra makes a return to its benefactors by killing one of their sons or daughters. The Gentoos say that the machine of the whole world rests on the head of one of these cobras, which must be of a very large size, but when they are asked where does that cobra rest its tail, they do not know how to reply. The most efficacious remedy against the bites of these cobras, and those of any other venomous animals, is the virtue, which a family of idolaters, called *Mandrecaros,* has in curing them. The members of that family, by taking a little water in their hands out of a well or a fountain, and giving it to drink, and throwing some on the head of the bitten individual, cures him infallibly. Only the males and the unmarried girls of the family enjoy this privilege. They cannot receive any remuneration for the cure. If, however, they accept any money, the remedy loses its efficacy. When any one of them is called to cure a bitten person, and he cannot attend to him personally, it is enough if he sends water which he has drawn by his own hands. Nor is it necessary that he should touch the water. It is sufficient for the purpose if he has drawn it by some vessel. Not long ago a descendant of this family became a convert at Margáo, and after being baptised retained the same virtue. He was employed as an interpreter of the Margáo Church, and seeing him make such easy and admirable cures, I tried to examine the principle and the basis of such a singular prerogative, but he could not tell me anything, except that it was a privilege which his family had enjoyed from centuries immemorial. After this man became a Christian, he had

a son, whom I baptised, and without much ado I say that he actually makes similar cures as his father did before."

It is said that people believed then, and I think they believe even now, that the Cobra-de-Capello is dreadful not only in its bite, but also in the revenge it takes on any person who molests it. It is supposed that if the cobra is not killed outright when it is once hurt by any person, some time or other it will seek out the offender and kill him. When the cobras are in pair and the male happens to be killed, the female is said to be sure to revenge herself sooner or later on the assassin of the male. It is also said that the cobra will traverse a large expanse of water, such as rivers, lakes, &c., in order to take its revenge.

These are some of the traditions regarding the cobra, and they enable us to compare the information which people had at the time of the Portuguese conquests with that of our own days. I pass now to the other animal, which the word *bis* prefixed to the word cobra brings into existence.

Having shown that the word *cobra* is a Portuguese word, it is not unreasonable to infer that the word which is prefixed to it might also be Portuguese in its origin, and it appears to me that it is so, and that the word is *bicho* made into *bis* by the process of contraction I have hinted at before. The original idea conveyed by the word *bicho* in the Portuguese language is that of an animal which bites, no matter what. Whether it bites man or beast, wood, clothes, or the earth, it is called in Portuguese the *bicho* of such and such a thing. By amplification the term has been applied to all living beings from man and beast to the microscopic bacteria. For instance, the expression *bicho homem* means a man who is a *mischievous animal, cunning* and *mischief-making*. A lion, a tiger, a cobra or any other animal, when it is larger than its ordinary dimensions, or when any one of them has made large depredations, admiration or fear of it would be usually expressed in the Portuguese language by saying "*he um bicho tremendo*," "it is a tremendous beast." Any animal, then, that bit the cobra or killed it habitually, would be called *Bicho de Cobra*. With your permission I am going to translate to you a passage on the subject from a book published in Goa in 1563. The author of it is Dr. Garcia de Orta, who lived in Goa for more than thirty years, and who was once the owner of the island of Bombay. It is as follows (he speaks to his friend Dr. Ruano) :—

"In the beautiful island of Ceylon, though it is full of a large

quantity of luscious fruit, birds and wild game; there is also a large number of serpents, which the people call *Cobras-de-Capello,* and which we would call in Latin *Regulus serpens.* [He meant most probably the king cobra, *Ophiophagus elaps,* a specimen of which we lately had in the cage in the other room.]

"On account of these, God created in that island the *cobra tree,* and its use in cobra bites was discovered, because there are in this island some *bichos* (animals) resembling the *ferrets,* which are called *quil* (others call them *quirpele*), and which very often fight with these serpents. If the *bicho* knows that it is going to fight with a serpent, or if it is afraid of it, it goes and bites a piece of the root of the plant which is above ground, and chews it, then it moistens its hands with the juice of the plant and applies it to the head, and to those parts which it knows the cobra will bite in its spring. It fights with the cobra, biting it and scratching it until it kills it; if it does not kill the cobra, or if it finds it stronger than itself, then the *bicho* called *quil* or *quirpele* goes to the root, and applies its juice again and repeats the fight with the cobra, and thus kills it and conquers. By these means the Sinhalese came to know that this tree and its root were of use in cobra bites; and the Portuguese believed in the virtue of this plant, both by what the country people told them, and by what they found out by their own experience, and made use of the plant against the poison. They also saw with their own eyes, that the story of the fight of the *bicho* with the cobra was only too true, and in order that you may be more certain of this if you are not tired, I shall relate to you a thing which a Franciscan friar, worthy of belief and a virtuous man, saw at Negapatam, a continent near that island of Ceylon." On his friend requesting him to relate the story, he thus continued: "Many Portuguese men have these *bichos* domesticated and tamed in their houses for killing rats and for fighting with *cobras de capello* which the joguees carry and by means of which they beg alms. These joguees are Gentoos, who go about begging, besmearing their bodies with ashes. They are venerated by the Gentoos, and also by Mussulmans; they wander about many countries, and know a great many medicines and applications, some of which are true, others are false. Many of these joguees play the trick of *passa-passa.* [This is a trick, which we see nowadays displayed by the jugglers with 3 small cups and 4 or 5 balls, a sleight-of-hand trick.] They carry with them those cobras of which I have spoken before, and after having drugged them they

pull out their teeth and fangs in order to prevent them from doing harm. With this and with a little familiarity, they (the joguees) put them round their arms and necks, and try to make us believe that they are under an enchantment. But I believe it is all a lie. I will relate to you the following case :—

"'A Portuguese gentleman at Negapatam' (and this is the story of the Franciscan friar) 'called a joguee who carried cobras with him, and told him to let his cobra fight with his (the gentleman's) *bicho*, but the joguee having pulled out the fangs of the cobra, wherein consisted all its strength, refused at first, but the gentleman gave him one *cruzado* (about two shillings and fourpence) and he consented. The *bicho* warned for the fight walked at first under the benches and chairs to see if it could smell the root of the cobra tree, but seeing that it could not get it, it daubed itself with its own saliva and came out to fight the cobra, which on seeing it made a dart at its head and slightly bit it twice or thrice, the *bicho* also bit the cobra as many times. Then both somewhat wounded, separated, but the cobra got the worst of the fight. The joguee having got the price of the fight and also the cobra remaining alive (which recovered afterwards) came back with another cobra, which had its fangs, and challenged the gentleman for another fight between the animals, on condition that he should pay him more money because his first cobra was nearly dying and he had brought another. The gentleman only offered him as much as he had paid before. The joguee was quite glad to accept it, because this time his cobra was better armed. The gentleman prepared his *bicho* for the fight, he caressed it first, then brought out for it some roots of the tree which the *bicho* chewed for some time, and taking some of the juice in its hands applied it to its head, loins and belly, and also to its former wounds. The *bicho* being thus prepared, the joguee brought his serpent, which raising half its body from the ground at once darted forward, but the *bicho* avoided its bite by jumping on one side. They went on in this manner for some time, the *bicho* hitting the cobra, and the cobra hitting the *bicho* also; at length the *bicho* jumped on the cobra's head or a little behind it, and bit, squeezed, and scratched it so, that when he found that the cobra was completely exhausted, he killed it. The cobra however was disabled by the very first bite of the *bicho*, for *the breath of the bicho is poison to the cobra.* Thus was the joguee's cobra killed, and he left the place broken-hearted.'"

This is the passage from Garcia de Orta, who was considered to be the highest authority in Natural History among the Portuguese in India. It was said at that time (and I am sure it is said also now in some places) that this *bicho* not only fought with, and killed the cobras, but that, when hungry, if it happened to spy a cobra, caught it, divided it into three parts, and ate the middle part; then it joined together the remaining two parts, and applied to the wound the juice or the leaf of some plant. The cobra then got well and walked off as quietly as if nothing had happened to it.

About 400 B. C. Aristotle mentioned this animal as being an enemy of serpents, in his *History of Animals*.

Pierre Belon, a French naturalist, who travelled in Greece, Asia, Egypt, Palestine, and Arabia, describes this animal in his *Observations of Singular and Memorable Things* he found in those places.

This book was published in 1555. I give an extract from it in the original French—" Les habitans d' Alexandrie nourrissent une bête nommée *ichneumon*, qui est particulièrement trouvée en Egypt. On la peut apprivoiser és maisons tout ainsi comme un chat ou un chien. Le vulgaire a cessé de la nommer par son nom ancien, car il la nomment en *leur langage* rat de Pharaon. Or nous avons vu que les paysans en apportoient des petits aux marché d'Alexandrie, où ils sont bien recueillis pour en nourrir és maisons, à cause qu'ils chassent les rats, les serpents, &c. Cet animal est cauteleux en épiant sa pâture; il se nourrit indifféremment de toutes viandes vives, comme d'escarbots, lézards, chamèleons, et généralement de *toutes espèces de serpens*, de grenouilles, rats et souris; il est friand des oiseaux, des poules et poulets."

Prospero Alpini, a Venetian naturalist, while acting as physician to the Venetian Consul in Egypt in 1580, had one of these animals with him, and like *Pips* of Mr. Sterndale, it also proved to him a friend. He describes it in his *Historia Egypti* thus: "Ichneumon seu Mus Pharaonis. Mihi ichneumon fuit ultissimus ad mures ex meo cubiculo fugandos; unum alui, a quo murium damna plane cessarunt, siquidem quotquot offendebat, interimebat, longeque ad hos necandos fugandosque fele est ichneumon utilior." These works were published up to the 16th century.

Engelbert Kaempfer, a German naturalist who was in India about 1690, is probably the first author who refers to the animal as the Mangoose. In the Amœnitates Academicæ of 1693 he refers to the cobra tree also, and he says that the Portuguese called it *Mungo* and

the Dutch *Muncus*. I give an extract from his writings only which refers of the subject. "Primum antidotum.....radix est plantæ malaice *Hampa du Tanah*, id est, Fel terræ, dicta a sapore amarissimo .....Lusitanis ibidem *Raiz* seu radix mungo appelata a mustela seu viverra, Indis *Mungustia* appellata quia radicem monstrasse, et ejus usum."

I could cite passages from other writers of the 17th and 18th centuries, such as Maillet, John Klein, Hasselquist, George Edwards, Linnæus, Albert Seba, Vincent Marie, Buffon, &c., but suffice it to say that they are unanimous in saying that the *Ichneumon* or *mangoose* is *serpenticida* or serpent killer. From this one can easily identify the *mangoose* or *Herpestes* of the present day, and which was once called in Greek and Latin *Ichneumon*, *Mus Pharaonis*, *Donula*, *Donola Mustela* and in French *Mangôuste*, &c., with the same animal described by Garcia de Orta as *Bicho de Cobra*.

It may be asked, that even granting that the mangoose is the *bis cobra*, how can the idea of its being a poisonous lizard be explained? When Vasco da Gama and his successors, imbued with the adventurous spirit of the age, set out to discover new countries, they fully made up their minds to conquer those countries, and christianise them, and also to appropriate their commerce. This they did by the sword, and while they thrust the Catholic religion on the people, they also forced them to learn the Portuguese language; for both the soldiers and the priests, by whom they were accompanied did not take the trouble to learn the language of the people, but spoke to them in their own. A large number of the converts were kept by the Portuguese, as personal servants and military and other retainers, who had to learn the language whether they willed it or not; they picked it up as best they could, and as it was to be expected, contorted it very much in speaking it. The converts and the priests were the chief factors in disseminating extensively into the country the Portuguese language, and this was done so effectively, that even now, after a lapse of three centuries, the Portuguese language, or a jargon purporting to be that language, is spoken in several places which have long since ceased to belong to the Portuguese nation.

The language and the religion are the two indelible traces which the Portuguese have left of their conquests in India. Moreover, a great many Portuguese words have been introduced into the several languages of the country, such as in Marathi, Guzerati, Hindustani,

Tamil, Canarese, Malyalim, Chinese, &c., and the word *bis-cobra* was one of them.

Strange as it may appear, there is another instance of the contraction of the prefix in connection with the word cobra, but in this case the animal is a perfect lizard, and it is not at all poisonous, as it was supposed. There is a brown lizard, about 9 or 10 inches long, with yellow stripes and a forked tongue, which is called "*Tia-de-cobra,*" in English "*cobra's auntie.*" Now the expression in the Portuguese proper is—*tira-se como cobra*—that is to say, "an animal that crawls about like a cobra." And it has undergone a similar process of contortion as the expression Bicho-de-Cobra.

As I have said before, the Portuguese in India named the animals they saw here according to their most prominent features; because their knowledge of Natural History was rudimentary; they consequently were not very clear about the Amphibia, Reptilia, Mammalia, &c. They regarded the Mangoose as a reptile, and it may be gathered from the old and new dictionaries that they were right then. A reptile is an animal that moves on its belly or by means of short small legs, such as *caterpillars, lizards, snakes, earthworms.* So say the dictionaries.

Almost all writers, modern writers included, are unanimous in saying that the Mangoose sometimes crawls with its belly on the ground, when occasion arises, to seize its prey, or as Buffon says: "elle marche sans faire aucun bruit, et selon le besoin elle varie sa démarche; quelquefois elle porte la tête haute, raccourcit son corps, et s'élève sur ses jambes; d'autrefois elle a l'air de *ramper et de s'alonger comme un serpent.*" Mr. Sterndale says "They are active and sanguinary, chiefly hunting *along* the ground." It is not to be wondered at then, if the Portuguese had an idea that *the bicho-de-cobra* was a lizard reptile.

That the Portuguese certainly regarded the *Mangoose* as a poisonous animal, may be gathered from the writings of Garcia de Orta. The *Oriente Conquistado* says that all lizards are poisonous; they are described therein as having their teeth "*set in different rows and hollow, having enclosed within them smaller ones filled with venom.*" In fact the Mangoose was described and taken to be in the last analysis as *that Poisonous Reptile Bicho-de-Cobra.* Well then the story of the *poisonous reptile, bicho-de-cobra* or *bis-cobra,* seems to have spread far and wide during the first 70 years or more of the Portuguese conquests in India. Subsequently, however, on the inter-

course between the Portuguese and the natives becoming greater and of a more familiar character, they began to be more observant of the language and other things of the country. They noticed that this animal was called by the natives *Mungutia, Mungus, Mungli* and by various other names in various places, but that the first two were more prevalent, and they now began also to call it *Mangús*. I have no doubt that the Dutch and the scientific travellers of other nations largely contributed towards generalising its native name, *Mangoose*.

As years rolled on, the Portuguese, the naturalists and the natives all called the animal Mangoose, and thenceforth the Portuguese term *Bis-cobra* fell into oblivion, but among the natives the idea of the *poisonous reptile Bis-cobra* still remained, and it has been handed down together with the exaggerated accounts of its tremendous poisonous properties.

The natives still believe in its existence, but they, like the Mussulmans of Cowper, are uncertain which animal was meant. Most probably having got an idea that it must have been a reptile, they have a suspicion that it is a lizard. Here then, I think, is the origin of the belief which the natives have in the poisonous lizard *Bis-cobra*.

BUTTERFLIES AND ANTS.

(*With Plates Nos.* 26 *and* 27.)

By Lionel de Nicéville, F. E. S.

(*Read at the Society's Meeting on the 7th May,* 1888.)

That there should be any connection between butterflies and ants is, I believe, known to few, though as regards one family of butterflies at least this relation is a very close and intimate one. As a rule, ants are the most deadly and inveterate enemies of butterflies, and ruthlessly destroy and eat them whenever they get the chance, as I have frequently found to my sorrow, when in a single night a fine brood of larvæ has been carried off by ants from the food-plant growing in tubs in my verandah, and not a single one has been left by the morning. In the case, however, of the larvæ and pupæ of some *Lycænidæ,* not only do the ants restrain their natural appetites by not eating these tempting morsels,

LARVÆ AND PUPA OF CURETIS THETYS, DRURY, ENLARGED.

(Also Enlarged view of the Tentaculum, with brush extended, on the 12th Segment of the larva.)

but they take the greatest care of the larvæ, defend them from their enemies to the best of their ability, and when they are about to turn to pupæ, conduct them to a safe place, where they may perform their transformations, and allow the newly-emerged and at first helpless butterflies to escape unmolested.

On the penultimate or twelfth segment of these Lycænid larvæ on the upperside are two erectile tentacula, and on the eleventh segment on the upperside in the dorsal line is an oval opening from which exudes a sweet liquid, of which the ants are inordinately fond, and to obtain which their care and attention of the larvæ is entirely due. The two tentacula on the twelfth segment do not apparently give off any fluid, and I have a theory, whether correct or no I cannot prove, that they were originally developed in the larvæ to drive away their enemies, probably Ichneumon-flies, much as the tentacula behind the heads of *Papilio* larvæ are used. In the larvæ of the genus *Curetis*, which do not appear to be affected by ants, these tentacula are very large, and when the insect is touched, they are extended with lightning-like rapidity and whirled round with great velocity. On Plate No. 26 will be found two enlarged figures of the larva of *C. thetys*, Drury, bred by me in Calcutta, also an enlarged figure of its curious jelly-like pupa. In the genus *Curetis* the tentacula are very long, much longer than in any other Lycænid larvæ known to me, and furnished at the apex with a tuft of long hairs forming a rosette, very similar in appearance to the anal tufts which the males of butterflies of the sub-family *Danainæ* can thrust out at will. *Curetis* larvæ appear to have no honey-gland, so ants do not attend them, nay, would probably eat them with much relish if they came across them, and were not frightened away by the rapidly-whirling tentacula. In the larvæ with the honey-gland these tentacula are much smaller and have short hairs at the apex; in these larvæ they are probably becoming aborted from want of use. In the larvæ of the genus *Virachola*, which feed in the interior of certain fruits, I have been unable to discover that they possess either a honey-gland or tentacula. They are not therefore, I believe, attended by ants, though Mr. W. C. Taylor and his daughter, Mrs. Wylly, hold to the contrary opinion, from observations they have made on the habits of these larvæ.

M. Guenée seems to have been the first to notice the existence of these organs in the larvæ of *Polyommatus bœticus*, Linnæus, which occurs in France as well as in India and elsewhere. This was in

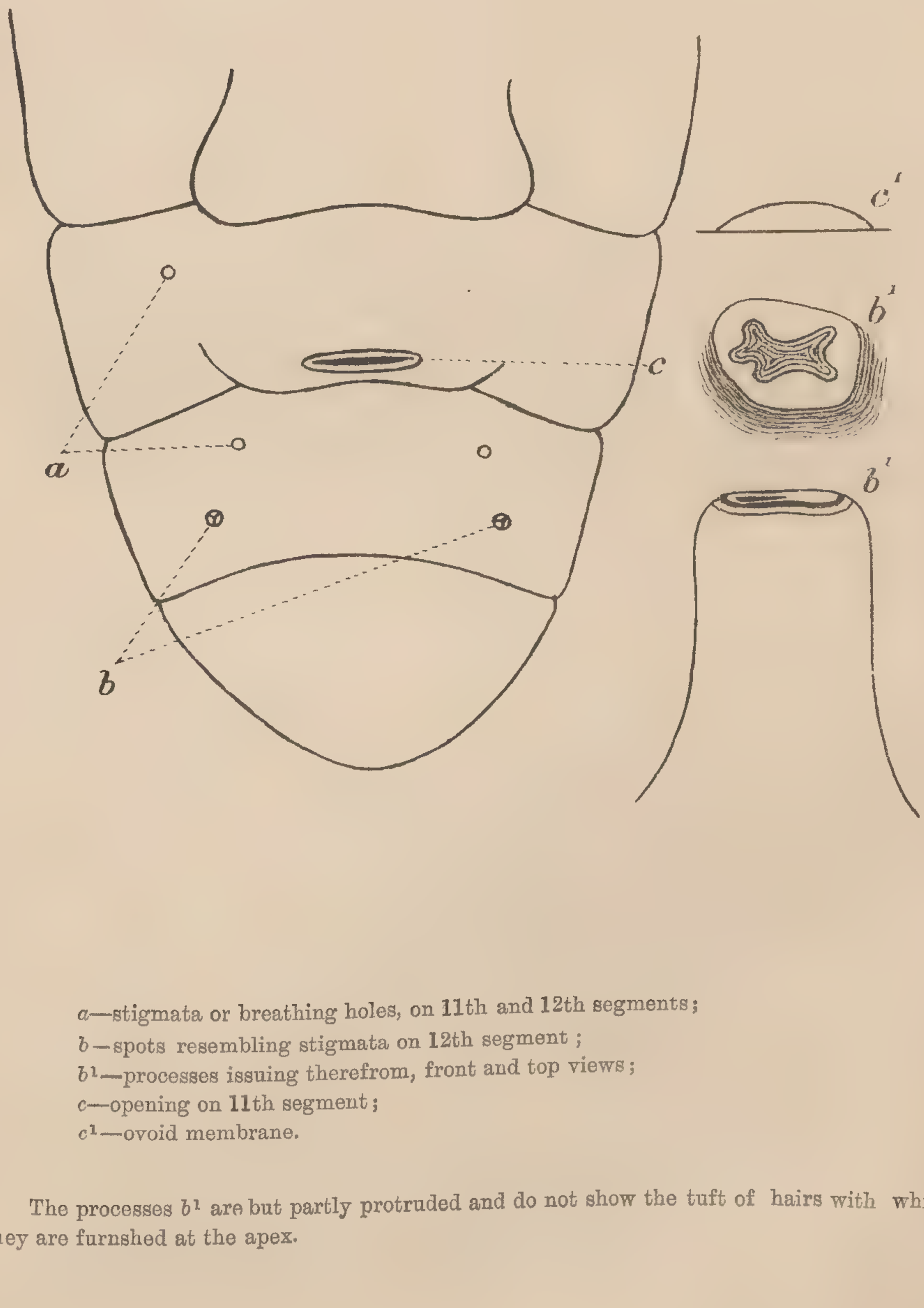
1867. Mr. Moore, in Vol. I. of his "Lepidoptera of Ceylon," published in 1881, quotes a note by Dr. Thwaites, who observed that certain formicidians attended the larvæ of some Lycænids; the species are not stated. Again, in 1886, Mr. W. Doherty records certain observations of his on the same subject. But Mr. W. H. Edwards has given in "The Canadian Entomologist," Vol. X., p. 1, *et seq.*, the fullest account I have seen of these organs and their use, and I have copied (Plate No. 27) a woodcut of the posterior segments very much enlarged of the larva of *Lycæna pseudargiolus*, Boisduval and Leconte, a North American butterfly, which he gave to illustrate his remarks. In Calcutta I have found that the larvæ of over a dozen Lycænidæ are affected by ants. I collected specimens of the latter, and have had them identified by Dr. Forel of Geneva, a great authority on ants. I now give the observations of a valued correspondent (Mrs. Wylly) on the same subject, and hope that others will follow up the matter, as there is still much to be learnt as to what species of *Lycænidæ* are affected by ants, what ants perform the offices of "milkers" and guardians to the larvæ, and what larvæ possess these special organs.

That ants attend *Aphides* (plant-lice), many Homopterons, *Cossidæ*, &c., in much the same way and for the same purpose, is well known, and it seems unnecessary to make any special reference to the fact beyond just mentioning it. This is what my correspondent has to say on the subject:—

"The larvæ of *Tarucus theophrastus*, Fabricius, are cultivated and protected by the large common black ants of Indian gardens and houses. The caterpillar, which varies in colour from light pure green to a dark reddish tint [this is a common variation in Lycænid larvæ] is about three-quarters of an inch long, louse-like in shape, and slow in movement, and it feeds on the *Zizyphus jujuba*, a small thorny bush of the jungles, with an edible astringent yellowish fruit, the "Byr-coolie" of the natives. Some *Lycænidæ* larvæ have the power of protruding and retracting at will two small fleshy tentacles or horns, each tufted with a brush of fine hairs, from the upper surface of the tail segments. Between [on the next segment anteriorly] these tentacles is a small slit, from which they exude a small drop of a juice of some sort eagerly sought by the ants, and which they can generally procure by stroking the larvæ gently with their antennæ. The ants set up what appears to be merely a temporary nest at the foot of the tree, the better to carry on their operations. Just

THE LAST SEGMENTS OF LARVA OF LYCÆNA PSEUDARGIOLUS, ENLARGED.

SHOWING THE ORGANS AFFECTED BY THE ANTS.



a—stigmata or breathing holes, on 11th and 12th segments;
b—spots resembling stigmata on 12th segment;
*b*¹—processes issuing therefrom, front and top views;
c—opening on 11th segment;
*c*¹—ovoid membrane.

The processes *b*¹ are but partly protruded and do not show the tuft of hairs with which they are furnshed at the apex.

before the rains set in, about the middle of June, great activity among the inhabitants of a *Zizyphus* tree may be observed. The ants are busy all day long running along the branches and leaves in search of the larvæ, and without fail an ant will come on one full-grown, and meditating on the choice of a snug retreat [in which to turn to a pupa]. A friend or two turning up, the ants set to work to guide and drive their caterpillar in the direction they wish him to go, *i.e.*, down the stem of the tree towards their nest. This is not always an easy business if the prisoner is refractory and would prefer going somewhere else. But as a rule they are docile and easily led. Having kept guard over him until they get him safely into his proper berth in the row, and he has accepted their ultimatum as final, he drops off into the preliminary doze, and undergoes his transformation into a pupa. If you gently scrape away the loose earth piled up at the base of the tree, you will see some hundreds of larvæ and pupæ in all stages of development arranged in a broad even band all round the trunk, and lightly covered with earth. The ants object to their being uncovered, and will immediately set to work to recover them, and if you persist, they will remove all the chrysalids, and bury them lower down. When the butterfly is ready to emerge, which is in about six or seven days, it is tenderly assisted to disengage itself from its shell, and should it be strong and healthy, it is left undisturbed to spread and strengthen its wings and fly away. But if by any mischance, it emerges deformed and too crippled to use its wings, a catastrophe occurs. In one case a butterfly had fallen to the ground before its opening wings had dried, and one of the soldier-ants tried to rescue it. He carried it back to the tree with the utmost care, and made several attempts to assist the butterfly to hold on again. Finding his efforts unavailing, he left the cripple for a short time to recover itself. On his return, seeing no improvement, he appeared to lose patience, and rushing in bit off both the deformed wings at the base, and carried off the wingless body into the nest below, whether as food for the community, or for what other purpose, I was unable to ascertain. That was the only occasion on which I ever saw any high-handedness on the part of the ants, though their usual ill-temper requires no very close observation to detect. It is curious sight to watch the fragile and delicate newborn butterflies wandering about, all feeble and helpless, amongst the busy crowd of coarse black ants, and rubbing shoulders in perfect safety with the ordinary

fierce big-headed soldiers; as odd a contrast as the fresh creamy whiteness of the opening wing, the flash of purple and blue, and the sparkle of green and silver eyes is to the darkness and dinginess of their queer home. For some time after the butterflies have gained strength to fly away, they remain hovering over the nest. A larva of a species of *Catopsilia* [one of the *Pierinæ* or 'Whites'] I threw down as an experiment, was immediately set upon and torn to pieces in a second by the ants."

"I took a *T. theophrastus* larva from a tree, and introduced it on the pathway of another company of the same species of ants who lived in our verandah, but kept no 'farm,' and it was odd to see the ants come tumbling out headlong to fight the intruder, and the sudden way they cooled down on investigation of the foe. None attempted to harm him, and he was politely escorted across their boundary, the ants running alongside, and feeling him all over with their antennæ. This must have been instinct, as they could have had no former knowledge of him as a "milk-giver." The dead chrysalids in an ants' nest are carefully removed and thrown away outside; the ants also distinguish between the dead and living."

ON THE LEPIDOPTERA OF KARACHI AND ITS NEIGHBOURHOOD.

By Col. C. Swinhoe, F.L.S., F.Z.S., &c.

(*Continued from page* 134.)

PSEUDO-DELTOIDES.

Thermesiidæ.

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Azazia rubricans.

Ophiusa rubricans, Boisd., Faun. Lep. Mad., p. 106, pl. 16, f. 1 (1834).

Thermesia transducta, Walker, xxxiii., p. 1058, ♂ (1865).

Thermesia consueta, Walker, Char. undescribed. Lep. Het. p. 93 (1869).

June to January.

DELTOIDES.

HYPENIDÆ.

123

Rhynchina xylina.

Rhynchina xylina, Swinhoe, P.Z.S. 1886, p. 452.

July, 1886.

124

Hypena laceratalis.

Hypena laceratalis, Walker, xvi., p. 60 (1858).

July, 1886, in great numbers.

125

Hypena mimicalis.

Hypena mimicalis, Swinhoe, P.Z.S., 1885, p. 471, pl. 28, f. 618.

October, 1886. A pair taken on board the steamer leaving Karachi.

HERMINIIDÆ.

126

Byturna digramma.

Bocana digramma, Walker, xxxiv., p. 1170 (1865).

June, 1880 and September, 1886.

127

Aginna robustalis.

Herminia (?) *robustalis*, Guén., Delt. et Pyral, 58, 66, ♀ (1854).

Bocana turpatalis, Walker, xvi., p. 174 ♂ ♀ (1858).

January, 1886.

128

Rivula sericealis.

Pyralis sericealis, Denis, Wien. Verz., p. 122, n. 18, (1775).

Noctua munda, Berl. Mag. iii., p. 296.

Rivula limbata, Herr.-Schäff., Eur. Schm. vi., 4475.

Common in almost every month of the year.

129

Rivula flavonigra.

Rivula flavonigra, Swinhoe, P.Z.S., 1884, p. 522, pl. 47, f. 15.

Common from September to March.

130

Myana sopora.

Myana sopora, Swinhoe, P.Z.S., 1884, p. 522, pl. 48, f. 5.
January and March, 1880.

131

Myana atromacula.

Myana atromacula, Swinhoe, 1884, p. 523, pl. 48, f. 5.
February, 1880.

PYRALES.

Botydidæ.

132

Botys iopasalis.

Botys iopasalis, Walker, xviii., p. 652 (1859).
Common from May to September.

133

Botys incoloralis.

Botys incoloralis, Guén., Delt et Pyral., p. 332, 369 (1854).
September to December.

134

*Botys subliturali*s.

*Botys subliturali*s, Walker, xxxiv., p. 1452 (1865).
July and August, 1886.

135

Botys abstrutsalis.

Botys abstrutsalis, Walker, xviii., p. 663 (1859).
July to November. This insect, which is common in many parts of India, will have to be re-named, as it is not identical with Walker's type, which came from Java.

136

Ravanoa creonalis.

Botys creonalis, Walker, xviii., p. 579 (1859).
„ *neoclesalis*, Walker, xviii., p. 635.
„ *suspicalis*, Walker, xviii., p. 667.
„ *connectalis*, Walker, xxxiv., p. 1411 (1865).
August, September and October, 1886.

137

Ebulea catalaunalis.

Botys catalaunalis, Dup., Lep. Fr., viii., p. 330, pl. 232, f. 8 (1831).

Margaritia cilialis var., Steph., Cat. Brit. Lep., p. 239 (1850)

Botys venosalis, Walker, xxxiv., p.1401 (1865).

May and June; October and November, common.

138

Scopula vinctalis.

Scopula vinctalis, Walker, xxxiv., p. 1476 (1865).

April and May, 1885.

139

Scopula palmalis.

Scopula palmalis, Swinhoe, P.Z.S., 1884, p. 525, pl. 48, f. 11.

September, October and November.

140

Udea fotalis.

Scopula fotalis, Swinhoe, P.Z.S., 1885, p. 875, pl. 57, f. 9.

September and October, 1885; August to October, 1886, in great numbers.

141

Nymphula interpunctalis.

Pyralis interpunctalis, Hübn., Pyral., ii., 11, pl. 19, f. 128 (1797).

,, *undalis*, Hübn., Pyral., pl. 14, f. 90.

May to August, common.

142

Godara comalis.

Pionea comalis, Guén., Delt. et Pyral. p. 368, n. 453, ♂ (1854).

,, *incomalis*, Guén., Delt. et Pyral., p. 369.

Common in nearly every month of the year.

MARGARONIDÆ.

143

Glyphodes fessalis.

Glyphodes fessalis, Swinhoe, P.Z.S., 1886, p. 459, pl. 41, f. 3.

May, June and October.

144

Phakellura indica.

Eudioptis indica, Saunders, Trans. Ent. Soc., 1851, p. 163, pl. 12, f. 5, 6, 7.

Phakellura gazorialis, Guén., Delt. et Pyral., p. 299, n. 304, (1854).

June to October common.

145

Cydalimia conchyalis.

Margarodes conchyalis, Guén., Delt. et Pyral., p. 303, n. 317, pl. 8, f. 9. (1854).

On board the steamer leaving Karachi, October, 1886.

146

Cydalima submarginalis.

Botys submarginalis, Walker, xxxiv., p. 1414 (1865).

August to September, common.

147

Pygospila tyres.

Phalæna (*Pyralis*) *tyres*, Cram., Pap. Exot., vol. iii., p. 124, pl., 263, f. C, ♀ (1782).

Pygospila costiflexalis, Guén., Delt. et Pyral., p. 313, ♀ (1854).

July and August, 1886, in great numbers.

148

Noorda blitealis.

Noorda blitealis, Walker, xix., p. 979 (1859).

Scopula subjectalis, Walker, xxxiv., p. 1472 (1865).

July and August, 1886, in great numbers.

ASOPIDÆ.

149

Hymenia fascialis.

Phalæna (*Pyralis*) *fascialis*, Cram., Pap. Exot., iv., pl. 398 f. O. (1782).

Phlæna angustalis, Fabr., Mant. Ins., p. 309 (1787).

„ *recurvalis*, Fabr., Ent. Syst. iii., 2, p. 237, n. 407 (1794).

Hymenia diffascialis, Hübn., Verz. Bek. Schm., p. 361 (1825-27).

Hydrocampa albifascialis, Boisd., Faun. Ent. Madag., Lep., p. 119, pl. 16, f. 1 (1834).

June to December, common.

150

Coptobasis lunalis.

Botys lunalis, Guén., Delt. et Pyral., 352, n. 417 (1854).
„ *thyasalis*, Walker, xviii., p. 734 (1859).

August, 1886.

151

Coptobasis opisalis.

Coptobasis opisalis, Lederer, Ent. Mon., vii., 482, pl. 16, f. 10 (1863).

On board the steamer leaving Karachi, October, 1886.

152

Leucinodes orbonalis.

Leucinodes orbonalis, Guén., Delt. et Pyral., p. 223, n. 187 (1854).

August, 1886.

SPILOMELIDÆ.

153

Synclera traducalis.

Eudioptis traducalis, Zeller, Lep. Micro. Caffr., Kongl. Vet. Abrad. Handb., p. 54 (1852).
Synclera retinalis, Lederer, Wien. Ent. Mon., i., p. 100 (1857).
Glyphodes univocalis, Walker, xviii., p. 499 (1859).
Synclera traductalis, Lederer, Wien. Ent. Mon., vii., p. 445 (1863).

June to December.

154

Haritala cassusalis.

Zebronia cassusalis, Walker, xvii., p. 477 (1859).
„ *aurolinealis*, Walker, xvii., p. 478.
„ *amænalis*, Walker, xxxiv., p. 1352 (1865).
Botys signatalis, Walker, xxxiv., p. 1444.
„ *faustali*, Lederer, Wien. Ent. Mon., vii., p. 375, pl. 10, f. 15 (1863).
Notarcha cassalis, Meyrich, Trans. Ent. Soc., 1884, p. 311.

July to October.

ENNYCHIDÆ.

155

Pachyzancla mutualis.

Botys mutualis, Zeller, Lep. Microp. Caffr., Kongl. Vet. Abrad. Handd., p. 40 (1852).

,, *stultalis*, Walker, xviii., p. 669 (1859).

June to December, 1885; July, 1886.

156

Hedylepta abruptalis.

Asopia (?) *abruptalis*, Walker, xvii., p. 371 (1859).

August, 1885, and September, 1886.

157

Rhodaria arida.

Rhodaria arida, Butler, P. Z. S., 1881, p. 621.

May, 1880.

158

Rhodaria juncturalis.

Rhodaria juncturalis, Walker, xxxiv., p. 1283 (1865).

August, 1886,

HERCYNIDÆ.

159

Herbula meleagrisalis.

Herbula meleagrisalis, Walker, xviii., p. 324 (1865).

Common from February to August.

STENIIDÆ.

160

Spanista ornatalis.

Asopia ornatalis, Dup., Lep. France, viii., p. 207, pl. 223, f. 8 (1831).

Botys saturalis, Treit. Schler Eur. Schm. Suppl. 2, p. 29,

Cataclysta (?) *elutalis*, Walker, xvii., p. 448 (1859).

Pyralis deciusalis, Walker, xix., p. 905 (1859).

September and October, 1885; July, 1886.

161

Lepyrodes geometralis.

Lepyrodes geometralis, Guén., Delt. et Pyral., p. 278, pl. 8, f. 6 (1854).

June to December, common.

HYDROCAMPIDÆ.

162

Paraponyx affinialis.

Paraponyx affinialis, Guén., Delt. et Pyral, 270, p. 25 (1854).

July to October, common.

163

Oligostigma incommoda.

Oligostigma incommoda, Butler, P.Z.S., 1881, p. 180.

November, 1879.

164

Hydrocampa tenera.

Hydrocampa tenera, Butler, P.Z.S., 1883, p. 167.

January and May, 1880.

PYRALIDÆ.

165

Pyralis gerontesalis.

Pyralis gerontesalis, Walker, xix., p. 896 (1859).

„ *lantatella*, Walker, xxvii., p. 124, ♂ (1863).

„ *despectalis*, Walker, xxxiv., p. 1243 (1865).

„ *miseralis*, Walker, xxxiv., p. 1244.

January, 1880 ; December, 1885 ; May and July, 1886.

166

Pyralis suffusalis.

Pyralis suffusalis, Walker, xvii., 390 (1859).

Tatta, August, 1886.

167

Pyralis uberalis.

Pyralis uberalis, Swinhoe, P.Z.S., 1884, p. 523, pl. 48, f. 10.

May, 1879.

168

Pyralis rubicundalis.

Pyralis rubicundalis, Swinhoe, P.Z.S., 1885, p. 864.

June and September, 1885.

169

Stemmatophora ingrata.

Stemmatophora ingrata, Butler, P.Z.S., 1881, p. 621.

May, 1880.

170

Hellula undalis.

Phalæna undalis, Fabr., Ent. Syst., iii., 2, p. 226 (1794).
Scoparia alconalis, Walker, xix., p. 827 (1859).
„ *optatusalis*, Walker, xix., p. 1018.

May and June; November and December, common.

171

Hypotia vulgaris.

Hypotia vulgaris, Butler, P.Z.S., 1881, p. 621.

Common all the year round.

172

Hypotia vafera.

Hypotia vafera, Swinhoe, P.Z.S., 1884, p. 523, pl. 48, f. 8.

August, 1880; October, 1885.

173

Hypotia rubella.

Hypota rubella, Swinhoe, P.Z.S., 1884, p. 523, pl. 48, f. 9.

January and August, 1880. Received from Lindi, February, 1886, and from Hyderabad, April, 1886.

SCOPARIDÆ.

174

Nemophila hybridalis.

Pyralis hybridalis, Hübn., Pyral., 29, 20, pl. 17, f. 114 (1797).
Tinea noctuella, Wien. Verz., p. 136, n. 35.
Nemophila noctuella, Lederer, Wien. Ent. Mo., vii., p. 379 (1863).

Common in nearly every month of the year.

175

Scotormera tristis.

Scotormera tristis, Butler, P. Z. S., 1881, p. 623.

March, 1880; September and November, 1886.

176

Dosara cœlatalis.

Dosara cœlatalis, Walker, xix., p. 829 (1859).

September and November, 1885; July and August, 1886, in great numbers.

GEOMETRES.

Ennomidæ.

177

Hyperythra phantasma.

Hyperythra phantasma, Butler, P. Z. S.,1881, p. 615.

February and March.

178

Hyperythra swinhoei.

Hyperythra swinhoei, Butler, Ann. and Mag. Nat. Hist. (1880), (5) vol. v., p. 223.

Boarmidæ.

179

Boarmia cornaria.

Boarmia cornaria, Guén., Phal., i., 245, 390 (1857).

June, 1885; March, April and August, 1886.

180

Hypochroma dispensata.

Hypochroma dispensata, Walker, xxi., p. 485 (1860).

January and June, 1880.

181

Hypochroma pseudo-terpnaria.

Hypochroma pseudo-terpnaria, Guén., Phal., i., p. 276 (1857).

January and June, 1880.

Larentidæ.

182

Lycanges albatus.

Lycanges albatus, Swinhoe, P.Z.S., 1885, p. 862, pl. 56, f. 5.

October, 1886.

183

Lycanges demissus.

Lycanges demissus, Swinhoe, P. Z. S., 1886, p. 456.

August and September, 1886.

184

Lycanges defamataria.

Acidalia defamataria, Walker, xxii., p. 752 (1861).

October, 1885.

GEOMETRIDÆ.

185

Thalera diatomata.

Timandra (?) *diatomata*, Walker, xxvi., p. 1616 (1862).

June to December, common.

186

Nemoria frequens.

Nemoria frequens, Butler, P. Z. S., 1881, p. 616.

Common all the year round.

187

Nemoria parvulata.

Nemoria parvulata, Walker, xxvi., p. 1559 (1862).

September, 1886.

188

Nemoria pruinosa.

Nemoria pruinosa, Butler, Ann. and Mag. Nat. Hist. (1880). (5), Vol. v., p. 224

September to December, common.

IDŒIDÆ.

189

Idœa actuaria.

Acidalia actuari, Walker, xxii., p. 752 (1861).

August, September and October, 1886.

190

Idœa distracta.

Acidalia distracta, Butler, P. Z. S., 1881, p. 616.

May, 1880.

191

Idœa inductata.

Acidalia inductata, Walker, xxiii., p. 792 (1861).

September to February, common.

192

Idœa invalida.

Acidalia invalida, Butler, Ann. Mag. Nat. Hist. (1879), (5) Vol. iv., p. 439.

May and December.

193

Idæa jacta.

Idæa jacta, Swinhoe, P. Z. S., 1884, p. 526, pl. 48, f. 12.

September, October and November, common.

194

Idæa remotata.

Acidalia remotata, Guén., Phal., i., p. 458, n. 762 (1857).

June, 1880; February, 1836.

MACARIDÆ.

195

Macaria lithina.

Tephrina lithina, Butler, P. Z. S., 1883, p. 171.

January and March, 1880; May, June and September, 1886.

196

Macaria streniataria.

Macaria streniataria, Walker, xxvi., p. 164 : (1862).

December, 1885; May, 1886.

197

Macaria strenuata.

Macaria strenuata, Walker, xxvii., p. 1646 (1862).

Common all the year round.

198

Tephrina arenaria.

Tephrina arenaria, Swinhoe, P.Z.S., 1884, p. 527, pl. 48, f. 13.

December, 1880.

199

Tephrina peremptaria.

Macaria peremptaria, Walker, xxiii., p. 929 (1861).

November and December, 1880; and October, 1885.

FIDONIDÆ.

200

Sterrha sacraria.

Phalæna sacraria, Linn., Syst. Nat., i., 2, p. 863, n. 220 (1766).

Geometra sanguinaria, Esper., Schmett, v., 173, pl. 30, f. 10, 11.

November, 1880; May, June and October, 1885.

201

Fidonia albofascia.

Fidonia albofascia, Swinhoe, P.Z.S., 1884, p. 527, pl. 48, f. 14.

September, 1880 and July, 1836.

EPHYRIDÆ.

202

Cyclophora fluidaria.

Ephyra fluidaria, Swinhoe, P.Z.S., 1885, p. 856, p. 10, pl. 56, f. 10.

August and October, 1886.

EROSIIDÆ.

203

Erosia adjutaria.

Doano adjutaria, Walk., Cat. Ceylon Ins.

Erosia adjutari, Walker, xxiii., p. 849 (1861).

,, *verticaria*, Felder, Reise Novara, pl. 128, f. 7 (1874).

,, *theclata*, Guenée, Phal., ii., p. 36 (1857).

July, 1886.

204

Erosia hyperbolica.

Erosia hyperbolica, Swinhoe, P.Z.S., 1884, p. 528, pl. 48, f. 15.

May, 1880.

CRAMBITES.

GALLERIDÆ.

205

Melisoblaptes bipunctanus.

Melia bipunctana, Haworth, M. S., Curtis, Brit. Ent., v., p. 201 (1828).

Tinea sociella, Hübner, Eur. Schm., Tinea, pl. 4, f. 24, v., p. 201.

Galleria anella, Zink.-Som., Germ. Mag. Ent., iv. p. 243.

Lamoria planalis, Walker, xxvii., p 88 (1863).

Acrobasis imbella, Walker, xxx., p. 955 (1864)

June, July, and August, 1886, in numbers.

CRAMBIDÆ.

206

Apurima xanthogastrella.

Apurima xathogastrella, Walker, xxvii., p. 194 (1863).
Rupela degenerella, Walker, xxxiii., p. 524.
Lithosia cramboides, Walker, xxxi., p. 230.

September, 1885.

207

Crambus zonellus.

Crambus zonellus, Swinhoe, P.Z.S., 1884, p. 528, pl. 48, f. 16.

May, 1880; June, July and August, 1885; April, 1886.

208

Jartheza chrysographella.

Chilo chrysographella, Kollar, Hüg. Kasch., iv., p. 494 (1848).

April to October, common.

209

Schœnobius bisignatus.

Schœnobius bisignatus, Zeller, M. S., in coll. B. M., Swinhoe, P.Z.S. 1885, p. 461.

October and November, 1885

210

Eromene bella.

Tinea bella, Hübner, Tinea, f. 60 (?69)

September and November, 1885; July, 1886

211

Surattha albipennis.

Suraltha albipennis, Butler, P.Z.S., 1886, p. 383.

October, 1885.

PHYCIDÆ.

212

Nephopteryx figuella.

Nephopteryx figuella, Zeller, Walker, xxvii., p. 487 (1863).

September, October and November, 1885.

213

Pempelia illella.

Pempelia illella, Swinhoe, P.Z.S., 1884, p. 529, pl. 48, f. 6.

December to May.

214

Mella zinckenella.

Phycis zinckenella, Treit., Schmett. Eur., ix., 1. p. 201,
,, *itiella*, Treit., loc. cit., x., 3. p. 276 (1835).
Mella dymnusalis, Walker, xix., p. 1018 (1859).

April and May; October, November and December, common.

TORTRICIDÆ.

215

Pœdisca decolorana

Pædisca decolorana, Freyer, Neue Beitr., p. 318, pt. 5, 43, (1831-58)

February and May, 1880.

216

Hemirosia aurantina.

Hemirosia aurantina, Pryer, Cist. Ent., ii., 235.

July and August, 1886.

217

Tinea glabrella.

Tinea glabrella, Walker, xxviii., p. 478 (1863).

February, 1886.

218

Hapsifera eburnea.

Hapsifera eburnea, Butler, P.Z.S., 1881, p. 623.

September and October.

219

Eriocottis fuscanella.

Eriocottis fuscanella, Zeller, Isis, p. 813 (1847).

May, 1880.

220

Alavona cossusella.

Alavona cossusella, Walker, xxxv., p. 1816 (1866).

June, 1885.

GELECHIDÆ.

221

Ypsolopus robustus.

Ypsolopus robustus, Butler, P. Z. S., 1883, p. 174.

February, September and December.

PTEROPHORIDÆ.

222

Aciptilia congrualis.

Aciptilia congrualis, Walker, xxx., p. 943 (1864).

February and May, 1880.

223

Aciptilia ischnodactyla.

Aciptilia ischnodactylus, Treit., Lep. Eur., x. 3, 232.

October, 1885.

NOTES ON SOME BEES AND WASPS FROM BURMA.

By Captain C. T. Bingham, Deputy Conservator of Forests, Rangoon.

Below I give a list of a few bees and wasps that I have collected in Burma, with notes as to their habits, time of appearance, &c. I have been collecting Hymenoptera in various parts of Lower Burma for the last four years, but have only been able to identify a very few of the species procured.

Literature on the subject is not only scarce, but consists to a large extent of papers scattered through various scientific journals, proceedings of societies, &c.—papers it is next to impossible for a collecting naturalist in India to get together and carry about with him.

The nomenclature I have adopted in this list is that of the British Museum catalogue of hymenopterous insects.

The more striking orders of the Lepidoptera and Coleoptera can even in India count their students by scores. Hymenoptera have been wofully neglected. My object in writing this paper is to draw the attention of collectors to this fascinating group of insects:—

Halictus xanthognathus, Smith.

A pretty little bee, swarming about flowering trees from May to August. I have procured it at Henzada, Bassein and Rangoon. Originally described from Northern India.

Megachile dimidiata, Smith.

Common through the hot weather and rains, and coming like most of the other leaf-cutter bees, into the verandahs and rooms of

our wooden houses here, and selecting crevices and holes for their nests.

Megachile conjuncta, Smith.

Megachile rufipes, Smith.

Procured at Bassein only. The male of *conjuncta* is often considerably smaller than the female, and has the face covered with white instead of black pubescence.

Megachile disjuncta, Fabricius.

Commonest of all of this genus. The width of the white band across the back differs considerably in individuals *inter se*. I have watched this bee cutting off and carrying away circular pieces out of the leaves of the guava.

Megachile fraterna, Smith.

Not uncommon in the Pegu hills in November and December.

Crocisa histrio, Fabricius.

Of very wide distribution—India, France, Russia and Algeria. The blue interrupted bands on the abdomen vary in width in different specimens.

Anthophora zonata, Linnæus.

Anthophora confusa, Smith.

Henzada, Bassein, Rangoon: found throughout the year; in abundance during the rains. I have invariably found these bees keeping low down and buzzing about flowering shrubs and even grasses.

Xylocapa latipes, Drury.

Xylocapa æstuans, Linnæus.

Xylocapa olivieri, St. Fargeau.

These are the great carpenter bees, sometimes mistaken for and called "humble-bees" by people in India. The true humble bee, *Bombus*, is of course quite different.

The carpenter bees are very destructive to dry timber of any kind. I have seen a log even of the hard ironwood, Pyngado (*Xylia dolabriformis*), full of bee holes.

X. olivieri seems rare, and to be crepuscular in its habits. I have procured it only at Pegu.

Bombus eximius, Smith.

Procured on Mooleyit, Dawnat mountains, at an elevation of about 4,500 feet.

Apis dorsata, Fabricius.

This is the common honey bee of Burma.

Scolia quadri-pustulata, Fabricius.

A very variable insect, with the front of the prothorax however invariably yellow. Found on flowers May to September.

Scolia decorata, Burmeister.

Scolia instablis, Smith.

Scolia modesta, Smith.

Found on flowers, May to September.

Scolia aureipennis, St. Fargeau.

Rare; procured near Thayetmyo in October. Originally described from the Gambia, South Africa.

Scolia (*Elis*) *annulata*, Fabricius.

Scolia (*Elis*) *iris*, Burmeister.

Found on flowers, May to August. Heavy and sluggish; easily caught.

Scolia ignita, Smith.

A very lovely species, the rust-red down on the last four segments of the abdomen having a very rich sheen, and contrasting well with the jet black of the thorax and the coppery iridescence of the wings.

Scolia aureicollis, St. Fargeau.

Scolia ruficeps, Smith.

Scolia erythrosoma, Burmeister.

Fairly common from June to October.

Pompilus analis, Fabricius.

Rare; procured in December in the Pegu Hills at about 1,000 feet elevation.

Pompilus honestus, Smith.

Rare; a lovely insect, the whole of its body covered with bright golden pubescence. Procured near Rangoon in September.

Pompilus dorsalis, St. Fargeau.

Pompilus pedestris, Smith.

Common, Henzada, Bassein, Rangoon, July to November.

Pompilus unifasciatus, Smith.

Fairly common. The amount of fuscous tipping to the wings varies considerably in different individuals.

Mygnimia æruginosa, Smith.

Very common, May to October.

Ammophila nigripes, Smith;

Ammophila vagabunda, Smith.

This genus does not seem well represented here in Burma. The above are the only two species I have managed to find.

Pelopeus bilineatus, Smith.

Common; found all the year round. It very often comes into houses and builds its mud nest against the furniture, generally choosing the under side of a shelf of the dinner wagon, or the under-side of the seat of a chair, and sometimes the under side of a rafter or beam. Occasionally the nest is made with cells end-on to each other; ordinarily however the cells lie parallel. One egg is deposited in each cell, the number of which latter varies from three to seven. Each cell is stuffed to overflowing with spiders, which have been paralysed by being stung, but which are by no means dead, but keep alive and fresh for consumption by the larvæ. I have remarked that *P. bilineatus* seems to invariably keep to one pretty little green species of *Epeira*.

Pelopeus bengalensis, Dahlbom.

As common as the last, and constructing similar nests, but storing them with a different species of spider.

Chlorion lobatum, Fabricius.

Common. Varies in colour from a bronzy green to a dark metallic blue. I believe this species burrows into banks to construct its nest, and stores it with crickets.

Sphex argentata, Dahlbom.

Common, July to October.

Sphex ferruginea, St. Fargeau.

Rare; procured in December in the Pegu Hills.

Sphex vicina, St. Fargeau.

Sphex flavo-vestita, Smith.

These two species are by far the commonest of the *Shegidæ*. April to November found all over the country.

Ampulex hospes, Smith.

This lovely species, first described from Borneo from collections made by Mr. A. R. Wallace, is not uncommon near Rangoon in the rains. In the Pegu Hills I got a specimen not one-third of the size of the ordinary ones, but exactly alike in colouring and in the second segment of the abdomen being suddenly produced on the under side.

Larrada subtessellata, Smith.

Common, May to October.

Tachytes sinensis, Smith.

Common, May to October.

Cerceris instablis, Smith.

Common, May to October. I have found it solitary buzzing about flowers.

Eumenes esuriens, Fabricius.

Eumenes flavo-picta, Blanchard.

Eumenes petiolata, Fabricius.

All these are common about flowers from May to October. The last-mentioned builds a nest very like that of *Pelopeus*, only storing it with caterpillars instead of spiders. One nest I broke open contained the larva of some species of *Tortrix*.

Rhynchium brunneum, Fabricius.

Very common. Very frequently chooses its nest-holes in the wood-work of houses, and stores it like *Eumenes* with caterpillars.

Rhynchium metallicum, de Saussure.

Common, June to October.

Polistes hebræus, Fabricius.

Polistes stigma, Fabricius.

Both these are common, making their nests in June about the eaves of houses.

Vespa magnifica, Smith.

Karen Hills, 3,000 feet. Pegu Yoma, 1,000 feet. A huge hornet making its nest in hollow trees. The Burmans and Karens hold it in great fear. In investigating a nest too closely I was once stung by three of these insects in the face. The pain was something dreadful; my whole face and head swoll up, nausea and violent retching followed, and it was not till twenty-four hours afterwards that the inflammation began to subside. For two months after I was stung I felt the effects, in a numbed feeling on the forehead and cheek, where the stings had entered.

Stilbum splendidum, Fabricius.

A beautiful but common and widely-spread insect, found also in Europe and Africa. It lays its eggs in the cells of *Pelopeus*.

ON THE CULTIVATION OF FERNS FROM SPORES.

By M. H. Starling.

(*Read at the Society's Meeting on 2nd July*, 1888.)

The paper this evening will be a practical description of the difficulties which attend, and the best way of growing ferns from spores,

the result of my own practical experience in the matter, and I shall keep it as free as possible from scientific language. The first matter to be discussed is "What is a spore?" Spores are the little brown seed-like substances which are found in variously shaped clusters on the back of fern fronds, either covered up at some time of their existence by a thin membrane, or else always naked. Those who are not botanists would call them seeds, but they are not seeds in the sense in which we generally use the word. An ordinary flowering plant produces flowers which possess stamens and pistils either in the same or different flowers. On the stamens is a yellow cellular substance called pollen, which, when transferred to the pistil, fertilizes the seed and causes it to mature. When the seed is ripe, if it is planted in the ground, it will at once develope into a plant like that which produced it. Now ferns are not flowering plants, and spores are not seeds which have been fertilized by the action of pollen or in any similar way, and will not at once produce a plant like that from which they were gathered. What the process is I will now describe. The spore, in shape, is somewhat angular, and consists of two coats, an outer and an inner. When germination commences, the inner coat is protruded as an elongated tube, which bursts, and by cell division forms the prothallium which, in appearance, resembles a small lichen of a brilliant emerald green colour. When the prothallium first appears, it is only a bright green speck, but it will sometimes grow to a size which equals a section through the middle of an ordinary sized sweet-pea seed. From the prothallium root hairs are produced, and also, on the under surface two small bodies, or cells, called antheridia and archegonia. The antheridia represent the stamens in a flowering plant, and are cells in which are developed spiral filaments. The archegonia fill the place of the pistil and ovary in a flowering plant; in the centre is a canal leading to the germ cell in which is a small corpuscle. When the proper time has come, the antheridia burst, and the spiral filaments penetrate the germ cell and come in contact with the small corpuscle therein, which is thus fertilized and forms the primordial cell, from which the first frond springs. Thus the growth of a fern from a spore is much more complicated than the growth of a plant from a seed. Thus much science is necessary in order to enable us to understand what is going on under our eyes, though all that can be seen by the naked eye is the growth of the prothallium and the root hairs, and the final appearance of the frond. To pass on now to

practice. The fronds, the spores of which we desire to propagate, should be gathered when the spores are just brown, but not before, as they will probably not be sufficiently matured to germinate. If left after they have turned brown, there is always a chance of the best spores having been scattered, but in this matter one has often to take his chance of what is got. The fern from which the spores are taken should be as isolated as possible, so as to eliminate the chance of the spores of other ferns having dropped on its fronds. Having picked a few pieces of a frond, or a few fronds if they are very small, they should be placed in an envelope which should be closed, and care should be take that every portion of the edge of each flap is gummed down, otherwise if you tie up a number of these envelopes together in a bundle, and have to travel any distance with them, the spores, which detach themselves as soon the frond begins to get a little dry, will work out of one envelope and into another in the most extraordinary way. When you want to sow the spores the envelope should be cut along three sides of it with a sharp knife. On opening the envelope a large portion of spores will be found to have detached themselves; the pieces of fronds should then be shaken so as to clear them of spores, and if there are any spores still adhering to the underside of the frond, they should be rubbed off. The spores are then ready for sowing, unless the covering of the spores while on the fronds should happen to be bulky, in which case a little cautious shaking will separate the spores from the chaff, which can then be removed. This, as well as the sowing, should be done in some place protected from the wind, as the spores are very light and easily carried away by even a slight breath of air. Next as to the soil in which they should be sown. Ferns will germinate in any ordinary soil, but if you happen to take soil from the neighbourhood of growing ferns, it nearly always contains a quantity of spores of those ferns which will germinate before those you sow, and will in many cases crowd them out. The great thing is to get earth which contains no spores. I have successfully used earth which has been dug from the bottom of a newly-made deep excavation: but the best course it to take an ordinary brick and burn it thoroughly in a hot fire, so as to destroy any organic substance which may be in or adherent to it, and then powder it and put the powder into a tin canister, and keep it away from the garden. When you wish to sow fern spores, take a clean pot, fill it up to about half an inch from the top with good sweet mould, sprinkle

that with a thin layer of powdered charcoal, and cover that with a little less than one-eighth of an inch of the burnt brick powder. Smooth the surface, and press it gently so as to consolidate it. On this surface the spores should be sprinkled evenly and not too thickly, covered with a glass, a plain common finger-glass is very good, and water gently poured on the outside of the glass so as to moisten the earth in the pot without disturbing the spores, and by watering in this way from time to time the earth under the glass should be kept damp. After a time the bright green prothallia will appear, and after another interval the first frond curled up at the edge of the prothallium. But patience is needed at this stage, as the prothallia will sometimes be a long time in making their appearance; with other ferns the prothallia will come up very rapidly, but the fronds will be a long time in appearing. As soon as there are three fronds, the fern should be taken out of the germinating pot by means of a thin pointed stick and planted in a good ordinary mould, and kept without glass in the shade for a few days, when it will be fit to put in some place where if may get a little early morning sun. When once the plant is recognizable as a fern the progress of its growth differs very much. Some species grow very rapidly, so that in fifteen months I have grown a fern with stalks to its fronds four or five feet high, and the fronds stretching out from six to eight feet from side to side. On the other hand, I have had other species apparently refusing to grow at all for two or three years, and then getting on all right. On the table you will see some specimens of the ordinary way in which seedling ferns grow in size. You may ask, what is the good of taking all this trouble? In the first place it is very interesting to watch the whole course of fern life, and to study the infantile forms of ferns. Then you can often get a piece of fern frond with spores on it from places from which it would be dificult to get a fern. It is also much easier to take on one's walks half-a-dozen envelopes and fill them with fern fronds, than to take a coolie and a basket to carry roots you may wish to dig up, or to find some fern which you covet, while walking alone, and after digging it up, having to carry it home in your hand. At the same time I believe that in the study of the rudimentary forms of ferns will be a great means of determining to what class a fern belongs. Those who have had anything to do with the names of ferns must know how tiresome it is to find the same fern known by different names. Now where

there is a dispute as to the class in which a fern should be placed, I believe in many cases the class could be determined by growing from spores the fern whose class was disputed, and ferns acknowledged to belong to each of the classes to which the fern in dispute was referred, and comparing the first or first two fronds of each. I have not had time to work this out yet, but I have noticed a strong generic likeness in the very early fronds of ferns of the same class which does not continue so strong as the plant grows up to maturity. I have also found that where a fern has for a long time been classed in some particular class, but subsequently placed by some botanists in a separate class, the early form of that fern has turned out to be quite different from the early form of those with which it has been previously classed. How far this could be worked out I cannot at present say, and I am afraid I shall never be able to work it out as I should like, because I feel I am wanting in that enthusiasm on the subject, with just a slight touch of madness, which is necessary for the successful working out of a problem like this.

Dr. D. MacDonald proposed a vote of thanks to Mr. M. H. Starling for his interesting paper, and the meeting ended.

BOOK NOTICE

SPORT AND TRAVEL

An interesting journal of "Sport and Travel" has been written by Mr. H. Liscomb, who appears to be a most ardent sportsman. The book describes principally the sport to be found in the district of Astor, just beyond the Cashmere frontier. The list of game-animals of Astor is not a long one, and comprises two animals for which Cashmere is famous—the markhor and ibex—and urin (or wild sheep), the brown or snow bear, and the musk deer. Describing the markhor, Mr. Liscomb says:—

My experience of the Astor animal, recorded on the spot, inclines me to think that the male, in the month of April, at any rate, wears a dirty white coat on his back, which hangs some distance down his sides, making him a very conspicuous object indeed among rocks; the light "blue grey," or "greyish brown," hardly visible on the body. These were the old males; the young bucks, herding with the females, were decidedly of a "muddy red," that made them, when they were motionless, undistinguishable from their surroundings at even a short distance. Two weeks later, in another locality, across the Indus (Damot Valley) the old bucks had only a broad streak of dirty-white along their backs, and the light blue grey was very conspicuous.

The markhor is an ungainly animal; his long back and disproportionately short legs rather detract from his appearance as a game looking beast; his shaggy coat

and long hair which conceal the upper portions of his limbs make his ungainliness more conspicuous. Even in his gait he is not graceful, but none can deny his wonderful activity among the rocks and precipices of his favourite haunts, and he is notwithstanding these detractions, a noble animal, worthy the powder and lead of the best sportsman in the world. A venerable buck, standing solitary on a rock, contemplating the world below him, will make the blood of the most blasé sportsman tingle in his veins: or a herd of long-bearded seniors, gravely crossing a patch of snow, perhaps, just beyond the reach of your rifle, is a sight that will recur to your memory for many a year after. And the amount of fatigue and labour that you will have to undergo before you can bring a forty incher to bag will certainly create a wholesome respect in your bosom for the acute sense of smell and vision, and the wide-awakeness that this animal possesses in perfection.

My experience is that the markhor is not a cold or snow-loving animal like the ibex, though nature has not been niggardly in supplyiug him with winter clothing. He passes his life at a much lower level, at all seasons of the year than the other animal, and he seems to bear the heat of the early summer months without any inconvenience though he still wears his winter suit. As summer advances, he is driven higher by the flocks from the villages that graze gradually up as the snow keeps melting; and also by the swarms of flies, gnats, midges, and what not that make life a burden both to man and beast at a low level. The fresh and tender grass, too, can be found only near the snow line. These circumstances combine to keep him constantly moving upwards, till he reaches open slopes near the top of the range where he may then be seen in close proximity to the ibex. The rutting season overtakes him here by the end of September or beginning of October, and he has his short season of madness at this high elevation where cover is scarce and precipices unfrequent. Native shikaries have informed me that this is the time for markhor shooting, and that they themselves hunt him most frequently at this particular time. His shyness and seclusion, I am inclined to think, is caused a good deal by those ever present pests, the flies. The cool shades of the forest and thicket preserve him from their attacks during the heat of the day when these insects are liveliest. In the morning and evening when the cold has paralyzed the activity of the flies, the markhor is not loth to take advantage of the opportunity. The old bucks are decidedly lazy, and if a flock of them is watched for some time, a decided stiffness and slowness of movement will soon discover the seniors of the flock. The younger bucks are full of life and play, quick in their movements and have a set-to after every dozen mouthful of grass; the elders are always feeding or resting. The native shikaries say, the old bucks keep these youngsters with them for the sake of their keener sense of sight and smell, they are quicker to detect danger and so warn their seniors.

THE IBEX

Regarding the ibex, Mr. Liscomb writes :—

The ibex is by no one means an ungainly animal, as I have styled the markhor. He is lord of the mountain-tops, and looks every inch the monarch of all he surveys. But I must protest against the caricature of this animal at page 445 in Sterndale's book. The head shows none of the massiveness of the living animal;

and where, oh ! where is the beard, "from six to eight inches long?" As for the understandings of the figures in the book they are truly a libel on the sturdy limbs of this the gamest of mountain animals. Those spindle shanks would snap like pipe-stems, if they were used as I have seen the ibex use his legs while jumping from rock to rock in his mad career.

The ibex is the pleasantest animal to hunt that I know of within the limits of Kashmir. More real pleasure has been experienced in the pursuit after him than of all the rest put together. Markhor takes it out of you in a very short time; after you have secured a reasonable trophy you are apt to cry, "hold enough;" But the ibex is a gentleman in his manners and customs, as compared with his spiral horned cousin lower down on the mountain; and he gives you all the chances that a gentlemanly-minded animal should give to an honest foe. He is nevertheless "All there" when treading his ancestral hills, and after you have circumvented him, you feel that he has been a worthy opponent.

The most wide-awake animal in creation is certainly the female ibex, and she seems to exercise her vigilance solely for the benefit of the ungrateful male of her kind, who is by no means so watchful; in fact, if he is old and lazy, he keeps no look-out at all, after having comfortably laid himself up for the day. That duty falls to his compact little companion, and admirably she performs it. Uncomfortably perched on a jutting rock far above the rest of the flock, who are securely snoozing below on some soft patch of level or gently sloping ground, the sportsman's powerful telescope has watched her hour after hour lying motionless on her rocky bed, scanning untiringly, to the right and to the left and straight down before her, the mountain sides for miles and miles. The patient native of Kashmir is used to her sentry duty, and after taking in the situation, he too falls asleep like the bearded males, he is trying to circumvent, and waits patiently for a chance, but the hot-blooded Saxon, boiling over with energy and impatience, is fuming and swearing at one moment; and at the next watching the little animal through his glasses. The case is a perfectly hopeless one, there is no approach nearer than a thousand yards, without instant detection, for several hours to come at any rate; and the bad language that contaminates the pure mountain air in that locality is truly awful! How often have I resolved in these moments of desperation to shoot that one female in particular, and allow the long-horned careless one sleeping just beyond range, to go in peace just for the satisfaction of the thing. That feeling has come to more persons than myself, I am sure, when they have been similarly placed. The female ibex is the *bête noir* of the sportsman; she has spoiled many a careful stalk, and at other times has forced him to trudge many and many a weary mile to escape her all-seeing eye: when, if she had been absent, a walk of a few hundred yards would have placed him for his shot.

The report of the rifle is so similar to noises in these elevated regions that ibex are little alarmed by the crack of the weapon. "Falling rock," or "thunder" is the first idea that occurs to them when the sound reaches their ears, and their first start is to get out of the way of those familiar dangers. When a good stalk is made and the sportsman has his wits about him, several shots can almost always be obtained, and instances are not rare when three or four animals have been bagged at one stalk. The ground, too, in general is so favourable that the stalker can get within very short range, always providing that the sharp-sighted female

has been successfully dodged. I have shot bucks, at five, ten and fifteen yards distances, and a sportsman has informed me that on one occasion he could have touched the animals with the muzzle of his rifle.

CHASING THE MARKHOR.

Mr. Liscomb describes very minutely his experiences in search of markhor, and he shows that the sportman must make up his mind to be frequently disappointed before meeting with his reward. Here is an account of a successful chase :—

18th May.—Started after these blessed buck goats, again at 6 a. m. Went up to top of ridge and then along it till we came to their tracks ; and followed them down steadily for four hours. Going down this ridge was terrible work indeed. I am sure, we did not get over a mile in that time. The whole distance was one mass of crumpled rocks with great gaps between—the rocks were knife-edges, the edges to the sky, the slope below at a frightful angle, for a short distance, ending in blank precipices further down. Mirza Khan led over this dangerous ground at a good pace, always some distance ahead, going over double the ground I traversed, carefully peeping over the precipices on either side, and searching the hill sides below with the binoculars. Sharofa looked serious and did not relish the work at all, for Mirza Khan beat him at it out and out ; and he had to play second fiddle throughout. I gave in after 9 a. m., and sat down on a rock, blessing the goats with all my heart. I kept my eyes on Mirza Khan all the time a good distance below, quartering the ground like the best of trained dogs. At last came his faint whistle, and it galvanized the whole of us like the shock from a battery. The real excitement of the chase now began. I went as best I could and reached Mirza Khan in no time ; he said he had sighted the flock far down the precipices ! He led for half a mile more and then we had the markhor under us! They were feeding at the foot of the cliff on a patch of young tender grass. It was impossible to get a shot from this point : we had to go along the ridge some distance further and take them in flank, though the range would be greater ; came to a good place, a projecting rock with a stunted fir-tree growing by ; it served for some cover though cover was not necessary. We were above the animals, and they were so intent on the young grass that there was no danger of detection. Got into position and picked out the largest pair of horns I could see ; waited for some time, till I got a broadside shot, fired and—missed ! Fired the second barrel and missed again ! Took the second rifle, and at the third shot broke a foreleg. Another large markhor came into view, fired the fourth shot at him and missed ! Took first rifle (re-loaded by Sharofa) and fired again at the wounded one, who was now making off, and missed again ! The agony of that moment was hard to bear. The brute was limping off and would be round a projection and out of sight in ten paces more ! Luckily, just at the turn, he stopped for a second to look back. My last shot and my last chance. Desperation made me steady. I put up the second sight, and with deliberate aim placed the bullet at last in the proper spot, behind the right shoulder, and the markhor rolled down the slope some distance and lay dead. The range of this shot could not have been less than 300 yards. Firing downwards at an angle of 30 degrees is very difficult

work, and many misses must occur unless the hunter is well practised in this kind of hunting. At the last shot, the animal, though further off, was nearly level with me, and hitting him was easier. Mirza Khan and Ghariba, with drawn knife, started off at a frightful pace for the "halal" (cutting the throat), but the ground was most difficult ; they had to go back some distance the way we had come, then go down round one slope, cross the ravine and up the opposite hillside, on which the markhor was lying. It took them at least 15 minutes before they appeared on the opposite side, whereas the poor old buck had been goat's meat for nearly half an hour ! The halal was a failure ; but would not have been if Sharofa had not been so orthodoxically scrupulous. He shouted out that the animal was dead, and that no halal was possible; but to be careful about cutting well below the neck, &c., &c. Ghariba, in a rage, shouted back that he would halal. Sharofa then said the meat would be "makruh," unlawful ; that was the end of the meat. I now found out from Sharofa that, in this country, the game is always considered "halal" provided the hunter, after shooting the animal, follows him up and *never sits down till he has cut his throat*, though his last act may be performed hours after the animal has been hit, or is dead. But for this convenient interpretation of the laws a good deal of meat would be wasted in a difficult country like this. In all countries, where Mussalmans are the hunters, they always have some convenient dodge like the above. Sharofa superintended the cutting off the head through the telescope. When this was done we left our perch on the rock, going back and then down hill, making for the main stream. Then up to tent at 2-30 p.m.—and so ends the hunt of the 47-inches. Dimensions—length of horn round curve, 47 inches ; girth at base, 11-25 inches ; divergence at tips, 26·75 inches. I measured the hoof of one of the forelegs, length, 3·5 inches ; breadth at heel, 2·25 inches. Of my six shots only two took effect ; the third broke the left foreleg at the knee, the sixth through the right shoulder—a splendid shot at 300 yards if not more.

IBEX SHOOTING.

I have only another week for shikar and then my return tramp must begin, so I had better make the most of the few days left. Breakfasted, and went down spur into Boin Valley. Had not gone far when a hurricane of wind and snow and sleet came on, and I had to crouch behind a rock not much larger than myself on the bare hill-side: there was no other cover in sight, a few small birch trees were scattered about. Remained in this position for an hour; and saw no hope of the storm abating so made for camp straight down instead of going along the hill-side towards the head of the valley. We were thus obliged to abandon the exploration of a most likely portion of ibex country. Had not gone far when the storm suddenly came to an end. We regretted much having come down so soon ; but a Providence directs the movements of a solitary sportsman as well as the march of a nation. Sitting on the hill-side and scanning the central ridge of Boin, where I had shot the ibex, Mirza Khan saw three large bucks, not far from the spot where the first one had been bagged, but about 600 yards further down, towards the end of the spur, in the direction of camp ! Had the shower not driven us down so low we would certainly have missed seeing these three ! Two of the ibex were grazing about, the third was lying near a large flat white stone, a capital mark for guiding the

stalkers. He was a few yards above the other two, and certainly had the largest horns of all. In a direct line, they were not more than a mile from us, but to get to them we had certainly to go double the distance, down to the bottom of the velley, across the stream, and up again over some precipices that, from this side, looked utterly impossible. It did not take us long to rush down to the bottom but going up was much slower work. We had some trouble getting across the cliffs. There was luckily a goat path along the rocks that Mirza knew and followed. There were bad places in it here and there, but they were all crossed without a thought in the presence of the game above us. After this, going along the hill-side was easy enough, and I think we got into position above our quarry within an hour from our start. They had not moved from the spot where we had marked them down, and the large-horned one was still taking his ease near the white rock. By cautious creeping we got within fifteen yards of the large one in our front, and about thirty from the other two feeding below us. This was a most exciting position to be in, but it was also a most uncomfortable and trying one for me who had to use the rifle. The slope of the hill was very abrupt, and I could not get firm footing on the crumbling earth. I was standing behind a rock, partially covered by the branches of a small tree. When I stood on tip-toe, I could see the ibex lying down gazing steadily across the valley. There was a shallow water channel between us. When I stooped down I could see him indistinctly between the leaves of the tree. In neither position could I fire, and the excitement and uncertain footing were telling on my nerves! I bore this for at least two minutes, looking right into the eyes of the unconscious buck and admiring the splendid sweep of his horns. There was a far-off look in his large liquid eyes, as if he were watching for danger on the hill-side opposite, where we must have been under his view an hour ago ; he certainly was not conscious of the danger within fifteen yards of him! Sometimes he would lazily shake his head and flap his ears to drive the flies off, then he certainly looked into my eyes, but the thick screen of leaves and the rock prevented discovery. The wind was, of course, in the right direction for us. There was a small round vacant space among the leaves through which, I thought, I could bring the sights to bear on the buck's shoulder as he lay, but I still had to raise myself on my toes a little, and that was not a steady position for a shot! There was, however, no other way, and I had to chance it. Motioning Sharofa to hold up my feet with his hands, I stood on tip-toe, took aim and fired. Of course I missed! The buck sprang to his feet and stood confounded for a moment and I gave him the second barrel of No. 1. I missed again ! The ibex vanished round the hill and I thought seriously of suicide ; but Sharofa brought me to my senses by telling me to look out for the other two. I turned round and went down a few paces but no bucks could be seen. A minute after, as we stood motionless, ready for their appearance, one of them rushed from under our position to my right about 40 yards off. He was going at a good space, but I tumbled him over like a rabbit with a bullet through his neck.—*Bombay Gazette.*

PROCEEDINGS OF THE SOCIETY.

Proceedings of the Meeting on 9th April, 1888.

The usual monthly meeting of this Society took place on Monday, the 9th April 1888. Dr. D. MacDonald presiding. About 75 members were present.

The following new members were elected :—Mr. P. W. Mackinnon, Mr. Alfred Mull, Mr. Donald Bain, Mr. Thomas Summers, Lieut. H. R. F. Anderson.

Mr. H. M. Phipson announced that the following contributions to the Society's collections have been received :—

Contributions in March.

Contribution.	Description.	Contributor.
1 Insect Cabinet	.....	Mr. J. Parmenides.
1 Snake (alive)	Tropidonotus quincunctiatus	Mr. J. Brand.
2 Leverets (alive).....	Lepus ruficaudatus	Mrs. Wilkins.
58 Birds Eggs	From Sikkim	Mr. J. C. Parker.
3 Turtles' Skulls	From Aden	Mr. G. McMullen.
19 Animals Skulls	From Canara	Mr. F. A. Hill.
1 Malabar Squirrel (alive).	Sciurus malabaricus	Do.
2 Bear's Skins	Ursus labiatus	Do.
1 Cheetal's Skin	Axis maculatus	Do.
1 Panther's Skin	Felis pardus	Do.
A Number of Queen Termites	Termes dirus	Dr. Day.
1 Aviary.....	With 19 birds	Mr. E. M. Slater.
1 Panther's Skull	Felis pardus	Do.
A Collection of Moths.....	From Satara	Mr. R. B. Stewart, C. S.
1 Lesser Civet	Viverra mallacensis	Mr. H. Bicknell.
1 Chinese Gold Fish (alive)	With abnormal tail.....	Capt. A. Moore, R. N.
A Quantity of Shells	From Trincomallee.....	Do.
1 Snake	Ptyas mucosus	Dr. D'Monte.
2 Hen's Eggs.....	Curiously deformed	Mr. W. Stephens,
1 Snake	Lycodon aulicus	Genl. Pottinger.
A number of Beetles	From Zanzibar	Rev. H. Baur.
A collection of Snakes, Lizards, Scorpions, Centipedes and Insects ...	From Trincomalee	Mr. W. Connop, R. N.
1 Stuffed Fish	Tetrodon sp.....	Do.
1 Four-horned Antelope ...	Tetraceros quadricornis ..	Mr. H. S. Wise.
2 Sunbirds.....	.....	Mr. R. A. Straw.
3 large Gourds	From Muscat	Mr. S. V. Sukhtankar.
A number of Geological Specimens	From Aurungabad	Mr. F. Rose, P. W. D.
A Painting of the Fruit of	Sterculia guttata.....	Mrs. John Jardine.

Mr. H. W. Jones exhibited two of the new 28 bore sporting guns by MacNaughten of Edinburgh, which are said to shoot as well as an ordinary 12 bore, while they weigh only 4lbs. 6oz.

Mr. F. A. Hill also exhibited two fine pair of bisons' horns, shot by him in Canara.

Proceedings of the Meeting on 7th May, 1888.

The usual monthly meeting took place on Monday, the 7th May, 1888, Mr. J. H. Steel, A.V.D., presiding.

The following new members were elected : Mr. F. C. Rimington, Major J. H. Yule, and Dr. James Munday.

The Honorary Secretary acknowledged the following contributions since the last Meeting:—

CONTRIBUTIONS RECEIVED DURING APRIL.

Contribution.	Description.	Contributor.
1 Spotted Owlet (alive) ...	Carine brama	Mrs Gilbert.
1 Crocodile's Skin	Crocodilus palustris	Mrs. Pearson.
1 Snake	Dipsas gokool	Mr. M. C. Turner.
2 Birds of Paradise	Ptiloris alberti and Epimachas speciosus	Dr. Hay.
7 Crocodiles' Eggs	From Tulsi Take	Mr. S. Tomlinson.
A number of Marine Specimens	From a depth of 52 fathoms	Mr. G. B. Stacey.
1 Otter (mounted)	Lutra nair	Dr. W. Kay.
2 Chukor Partridges (alive)	Caccabis chukor	Dr. Anderson.
1 Fox's Skull	Vulpes bengalensis	Mr. F. Gleadow.
A quantity of Lizards, Snakes, and Insects ...	From Surat	Do.
3 Snakes	From Poona	Mr. R. Wroughton.
1 Wallaby (alive)	Macropus sp.....	Mr. H. Wenden.
2 Snakes	From Aden	Capt. Wilson.
1 Hyæna Cub (alive)	Hyæna striata	Rev. R. Winsor.
1 Crocodile (alive)	6 feet in length.....	Mr. S. Louard.
2 Panther's Cubs (alive) ...	Felis pardus	Mr. H. E. Winter, C. S.
1 Python (alive)	Python reticulatus	Dr. Jas. Munday.
1 Spoonbill's Head (mounted)	Platalea leucorodia	Capt A. Gwyn.

CONTRIBUTIONS TO THE LIBRARY.

Natural History of Plants (Baillon), from Dr. Dymock.
Study of the Mango Weevil (Simmonds), from the Author.
Life of Erasmus Darwin (Krause), Mr. James Murray.
Report of the Smithsonian Museum, Mr. James Murray.
Minerals and the Use of the Blowpipe (Griffin), Mr. James Murray.
Advanced Text Book of Geology (Page), Mr. James Murray.
The Fodder Grasses of Northern India (Duthie), from the Author.
Journal of the Asiatic Society of Bengal, Nos. 3 and 4.
Proceedings of the Linnæan Society of New South Wales, (Vol II., Part IV.

PROPOSAL TO START A ZOOLOGICAL GARDEN.

Mr. H. M. Phipson stated that a great many valuable specimens of animals had of late been offered to the Society, which owing to want of accommodation in their rooms in the Fort, they had been obliged to decline. He was of opinion that the time had now arrived when the Society should obtain, if possible, a convenient site on which to form a Zoological Garden of its own. Mr. Phipson reminded the members present that the finest collection of live animals in the world, the one in London, was originally started by, and had throughout been under the sole management of a private scientific society. There were sites in and about Bombay which would suit the purpose admirably, and if one of them could only be obtained, he felt sure the Bombay Natural History Society was strong enough to carry out the project

with success. Such a garden would, in a short time, become the chief attraction of the City, and if the entrance fee on native holidays did not exceed an anna, the advantages of such a place would be fully appreciated by the great mass of the people. The few animals, at present kept in the Victoria Gardens at Byculla, were not in a satisfactory condition, but the Municipality could not reasonably be expected to form a zoological collection at the expense of the ratepayers, and as Government had decided that no charge could be made for admission into the Victoria Gardens, after they had been so long open to the public, nothing could be done in that direction.

Mr. N. S. Symons said that he quite agreed with all the Honorary Secretary's remarks, and suggested that the committee should carefully consider the subject and place some definite plan before the members at an early meeting.

Dr. D. MacDonald seconded the proposal, which was carried unanimously.

Dr. J. A. da Gama then read an interesting paper on the "*Origin of the Belief in the so-called Bis Cobra,*" showing that the name is a corruption of bicho-de-cobra (*i.e.* the destroyer of cobras), a term applied to the mongoose by the early Portuguese settlers. Dr. J. A. da Gama quoted many ancient and quaint historians to prove this assertion, including Pierre Belon, Prospero Alpini, Engelbert Kaempfer, and Garcia de Orta. From the last writer it may be gathered that the Portuguese regarded the mongoose as a poisonous animal, and it was frequently referred to as *that poisonous reptile, bicho-de-cobra,* a creature whose venom was even greater than that of the dreaded cobra-de-capello. The Portuguese eventually adopted the term mongoose, and the word *bis cobra* gradually fell into disuse and was forgotten by them, but among the natives the idea of the *poisonous reptile bis cobra* still remained, and it has been handed down with exaggerated accounts of its tremendous poisonous properties. A full report of this paper will be found on page 154.

Mr. J. H. Steel proposed a vote of thanks to Dr. J. A. de Gama for his valuable paper in which he had traced out the origin of a term which had greatly puzzled naturalists of late.

The Honorary Secretary then quoted extracts from an exceedingly interesting paper received from Mr. L. de Nicéville, of Calcutta, on "Butterflies and Ants," which, owing to the lateness of the hour, could not be read in full. The paper appears in this number, page 164, with illustrations supplied by Mr. de Nicéville.

PROCEEDINGS OF THE MEETING HELD ON 2ND JULY, 1888.

THE usual monthly meeting of this Society took place on Monday, the 2nd July, 1888, and was largely attended. Dr. D. Macdonald presided.

The following new members were elected:—The Hon. Mr. Justice Parsons, Mr. Ameeroodin Tyabjee, Captain E. R. Shopland, Mr. W. S. Hexton, Mr. O. Myer, Mr. W. H. Trail, Mr. John Trail, Mr. W. S Millard, Mr. W. H. W. Searle, Mr. W. L. Cameron, C.E., Mr. J. L. Jenkins, Lieutenant B. Whitehouse, R.N., Dr. I. B. Lyon, and Mr. Kaikhosro N. Kabrajee.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions:—

CONTRIBUTIONS DURING MAY AND JUNE.

Contributions	Description.	Contributor.
Nests and Eggs of the Edible Nest Swiftlet.	Collocalia linchii.....	Lieut. B. Whitehouse, R. N.
1 Cat's Head (mounted).	Felis chaus	Mr. E L. Chappel, C.S.
1 Snake (alive).....	Lycodon aulicus	Mr. W. W. Squire, C.E.
1 Jackal's Skull.....	Canis aureus.....	Mr. R. P. Strong.
1 Otter's Skull	Lutra nair.....	Do.
1 Crocodile (alive).....	Crocodilus palustris.....	Mr. A. Breul.
1 Scorpion with young.....	.....	Capt. Dixon.
4 Bats (alive)	Magaderma lyra	Mr. L. H. Butcher.
Horns of the brow antlered Deer.	Rucervus eldii	Dr. Henderson.
A collection of Snakes.	From Burma	Do.
Trap-door Spider's Nest.	Do.	Do.
4 live Fish in a glass bowl.	.....	Mr. Cowajsee D.Furdoonjee.
65 specimens of Rock.	Found while excavating the Victoria Dock, Bombay.	Mr. J. Fleming, C.I.E.
1 Eggs	Pratincola caprata	Lieut. H. E. Barnes.
1 Porcupine's Skull	Hystris leucura	Mr. E. L. Cappel, C.S.
1 Indian Monitor	5 feet in length	Mr. M. C. Turner.
A Quantity of Corals	.....	Do.
16 Crocodiles' Eggs,.	Crocodilus palustris	Mr. S. Tomlinson.
Coral and Shells.....	From the Red Sea	Mrs. Briscoe.
Net of the Common Honey-Sucker.	Cinnyris zeylonica	Mr. H. F. Hatch.
1 Snake	Passerita mycterizans ...	Mr. H. W. Barrow.
1 Gecko	With two tails	Mr. S. Cooke.
1 Pied Crested Cuckoo (alive).	Coccystes melanoleucos ...	Mr. W. J. Essai.
1 Crow.....	Struck by lightning..... ..	Mr. W. Shipp.
A Quantity of Stalactites and Stalagmites.	From Poona	Do.
1 Snake	Trimeresurus strigatus ...	Mr. E. M. Slater.
1 Large Honeycomb.....	From Baroda.....	Mr. Vishbhoocan Atmaram.
Head of Nilgiri Wild Goat.	Capra hylocrius	Mr. E. M. Slater.
Corals	From Persian Gulf	Capt. W. Morrison, R.N.
1 Tortoise (alive)	Testudo elegans	Mr. Krishnarao B Navalkar.
1 Lynx (alive)	Felis caracal	Capt F. D. Alexander.
1 Panther Cub (alive).....	Felis pardus	Lieut. A. F. Pinhey.
1 Hyæna Skin	Hyæna striata	Mr E. Von. Hantelmann.
1 Indian Monitor (alive)	Varanus dracæna.....	Capt. R. C. Dixon.
2 Lizards	Calotes rouxii	Rev. F. Dreckmann, S. J.
2 Rats	(?) Sp.	Do.
Eggs of...	Crested Black Bunting ...	Mr. J. Parker.
Do.	White-cheeked Crested Bulbul.	Do.
Do.	Crimson-winged Laughing Thrush.	Do.
1 Rose Ringed Paraquet ...	.....	Sergt. Major Webb.
1 Aviary	.....	Dr. Langley.
Edible Birds Nests	Collocalia unicolor	Mr. C. R. Brendon.
1 Cobra (alive)	Naga tripudians	Mr. G. Carstensen.
1 Black Headed Cuckoo Shrike.	Voloccivora Syksii	Capt. Becher, R.A.
Fore-arm of Lion.....	From Gujerat	Mr. Ameeroodin Tyabji.
1 Paradise Flycatcher.....	Muscipeta paradisi	Dr. da Gama.
1 Lizard	Chiamela lineata	Mr. J. E. Wilberbore.
1 Pair Sambur Horns	Abnormal	Mr. W. Lee Kirby.
1 Nilgiri Goat's Head	Capra hylocrius	Dr. A. C. Gaye.
1 Indian Monitor (alive) ...	Varanus dracæna.....	Mr. W. Holland.
A Quanity of Larvæ	Psyllidæ sp.	Mrs. Ricketts.
1 Flying Lizard...	Draco dussumieri.....	Mr. T. R. D. Bell.
1 Snake	Cynopis malabaricus	Do.
5 Bird Eating Spiders	Mygale sp.	Mrs. H. S. Wise.
3 Snakes	From Canara	Do.

CONTRIBUTIONS TO THE LIBRARY, MAY AND JUNE.

Title of Book.	Presented by
Journal of Comparative Medicine and Surgery, Vol. IX., No 2.	By exchange.
Proceedings of the Zoological Society, 1886. Part 4, 1887, Part 1.	Mr. Jas. Murray.
Large Game Shooting in Thibet, Himalayas and N. India. (Kinloch)	Mr. C. B. Lynch.
Nature. Vols, I., II. and III.....	Rev. A. G. Kane.
British Association Report, 1881	Do.
Fertilization of Orchids (Darwin).....	Do.
The Aquarian Naturalist (Rymer Jones).	Mr. G. Ormiston, C.E.
Bulletin of the California Academy of Science, No. 7.....	By exchange.
Evolution without Natural Selection (Dixon)	Capt. Becher, R. A.
Wheat and Rice Weevils in India (Cotes).	From the Author.
Introduction of Insecticides into India (Cotes).....	Do.
List of the Butterflies of Khorda in Orissa.	Mr. W. C. Taylor

AN APPEAL FOR HELP.

The Honorary Secretary stated that he had heard recently from Mr. Robert Wroughton, of Poona, with respect to the collection of Hymenopterous insects (ants, bees, wasps, &c.) which that gentleman had for some years past been making for the Society. The collection now consisted of 489 species, but as the majority of these had been caught in the neighbourhood of Poona, the supply was nearly exhausted in that part of the country. The assistance of every member of the Society was earnestly solicited in order that this very valuable collection might be increased. Mr. Wroughton was now trying to work out the "life history" of the different species, and was consequently in want of the nests of all sorts of the hymenoptera. The females of some wasps were unknown, and as many of the hymenoptera were supposed to be parasitic on one another, discoveries could only be made by breeding and rearing. "Mud-balls" of all sorts so common on the walls of bath-rooms and verandahs, bits of rotten sticks hollowed out and closed up, "brown paper" nests. &c., should all be carefully collected, and sent to Mr. R. Wroughton, Forest Officer, Poona. The best way of transmitting specimens is to send them packed in dry sawdust, but each nest should be sent in a separate box.

EXHIBITS.

Mr. E. L. Barton exhibited 3 tiger's heads and one bear's head recently mounted by him for members of the Society, all of which were greatly admired.

Mr. John Wallace, C.E., also exhibited a new description of Camp-bed which he has recently invented. It appeared to possess the two essentials, *strength* and *lightness*, and when doubled up in a canvas bag with mosquito curtains, poles, &c., complete, weighed only 16lbs.

THE PROPOSED ZOOLOGICAL GARDENS.

The following letters, written by the Honorary Secretary to the Collector of Bombay and to the Municipal Commissioner, were laid before the meeting :—

6, *Apollo Street, Bombay,* 15*th June,* 1888.

From the HONORARY SECRETARY, Bombay Natural History Society; to the COLLECTOR OF BOMBAY, Bombay.

SIR,—(1). I have been requested by the Committee of the Bombay Natural History Society to ask you whether the Government of Bombay would be disposed to assist the Society in forming a zoological collection and aquarium, by placing at its disposal a piece of land, free of rent and taxes, for that special purpose.

(2). The principal reasons, which have induced the Committee to make the above request, are the following:—

I. The number of valuable and interesting specimens which are constantly being offered to the Society by its members from all parts of the country, but which owing to want of accommodation, the Committee are unable to accept.

II. The great interest which the inhabitants of this country take in such collections, and the importance of imparting a more accurate knowledge regarding the fauna of India and adjacent countries, regarding which the ignorance of the people is so great.

III. The desire on the part of the Committee of this Society to facilitate and promote scientific investigation regarding the habits of tropical animals, birds, and fishes, kept under favourable conditions for observation.

IV. The importance of increasing and improving the supply of fish (both fresh and salt water) and other important articles of food.

V. The necessity of encouraging the acclimatization and domestication of various birds and animals, and the importance of improving the indigenous breeds of cattle and farm-stock in this country.

3. The few specimens of animals at present kept at the Victoria Gardens, Byculla, are not in a satisfactory condition, but in the opinion of the Committee the Municipality cannot be expected to incur any considerable expenditure in maintaining a zoological collection at the cost of the ratepayers.

4. The Bombay Natural History Society, although it was started only in 1883, is a flourishing and growing institution, with 420 members, and the Committee are confident that if Government will grant them a suitable site, they will be able, in a few years time, to form a zoological collection which, besides being a credit to the City, will become an important educational factor amongst the more intelligent part of the native community.

5. The Committee count on the support of the Municipality of Bombay in carrying out its project, and would be prepared, in return, to enter into an agreement for the benefit of the poorer ratepayers, never to charge more than one anna entrance fee for adults, and half-an-anna for children *on all recognised public native holidays.*

(6). The site which, in the opinion of the Committee, is the best suited for the purpose of a zoological garden and aquarium, is the Chowpatty cliff, extending from the footpath leading up the hill, on the right (formed by the main water pipe) to the Siri Road on the left, including the vacant land at the foot of the hill. This land appears to be of little value for building purposes, but owing to its being protected from the strong sea winds, and being at the same time close to Back Bay, it possesses particular advantages for a zoological collection and for the erection of fresh and salt water aquaria, which the Committee consider to be of so much importance.

(7). The Society would also be glad if Government would allow them to rent the two bungalows which stand on the piece of land in question facing the old Chowpatty Road.

(8). I enclose a rough sketch of the ground which the Society desire (marked with blue lines on the plan), and attach a list of the present Office-bearers and Managing Committee.—I have, &c.,

H. M. PHIPSON,
Honorary Secretary.

H. E. Lord Reay, G.C.I.E., LL.D., President, Managing Committee: Hon. Mr. Justice Birdwood (Vice-President), Dr. D. MacDonald (Vice-President), Dr. G. A. Maconachie (Vice-President), Colonel C. Swinhoe, Rev. Fr. Dreckmann, S. J., Dr. T. S. Weir, Dr. Kirtikar, Mr. J. H. Steel, A.V.D., Mr. G. W. Vidal, C. S., Mr. W. F. Sinclair, C.S., Dr. Edith Pechey, Major W.S. Bisset, R.E., Lieut. H. E. Barnes, Mr. J. C. Anderson, Mr. E. L. Barton; Mr. A. Leslie, Honorary Treasurer; Mr. H. M. Phipson, Honorary Secretary.

6, *Apollo Street, Bombay*, 15*th June*.

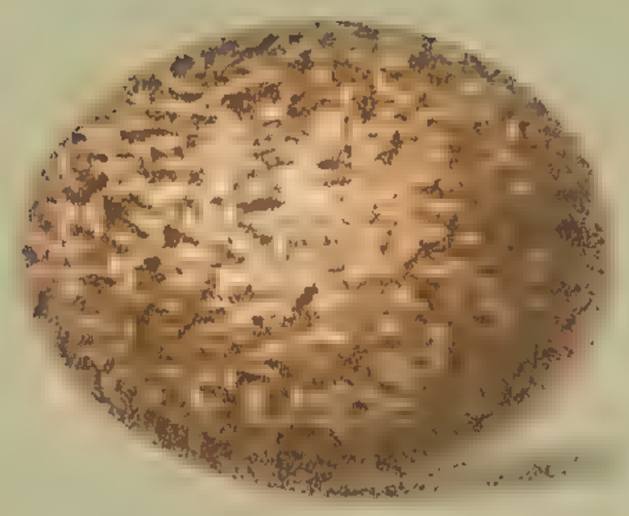
From the Honorary Secretary, Bombay Natural History Society; to the Municipal Commissioner, Bombay.

Sir,—I have been requested by the Committee of the Bombay Natural History Society to send you the enclosed copy of a letter, dated to-day, which I have addressed to the Collector of Bombay on the subject of a site for a proposed Zoological Garden in Bombay. The Committee are about to lay before the members of the Bombay Natural History Society some definite proposals, but before doing so they would like to know to what extent the Municipality would be disposed to co-operate with them in carrying out so desirable a project.

I am instructed to say that if the Municipality would agree to hand over to this Society (in the event of their obtaining the site) the specimens now kept in the Victoria Gardens, with the cages, building materials, &c., and to make an annual contribution of a sum equal to the amount now spent in maintaining the animals, the Committee of the Society would, in return, propose that for the benefit of the poorer ratepayers, the Society should bind itself never to charge more than 1 anna for adults, and ½ anna for children, as an entrance fee into its garden *on all recognised native public holidays*.

You will observe that the site which the Committee hope to obtain, and which they consider to be most suitable for Zoological Gardens and Aquaria, is the piece of vacant land at Chowpatty and the ground which extends up the side of the hill to the edge of the cliff. The narrow piece of ornamental land between the road and the edge of the cliff, would not be required, and the Society would engage not to obscure the view in any way from he road.—I have, &c.,

H. M. PHIPSON,
Honorary Secretary.



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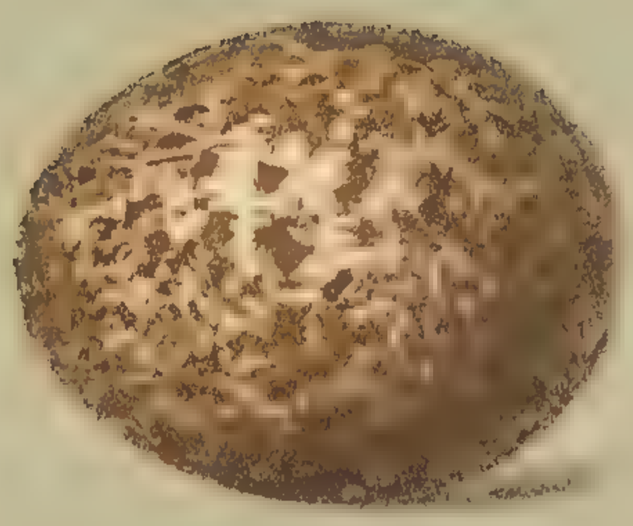

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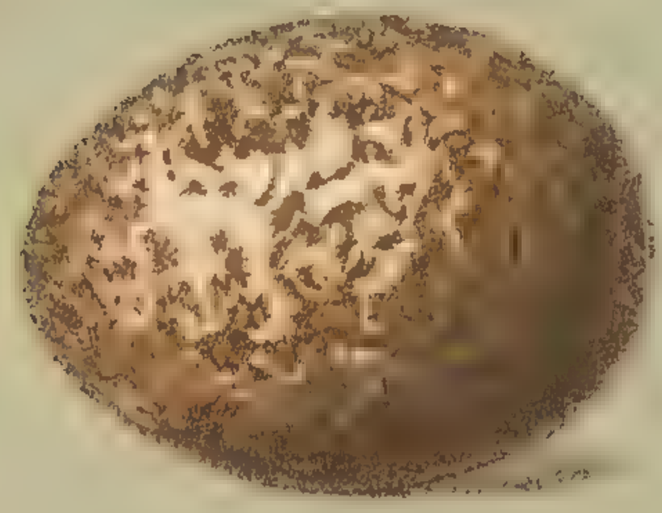

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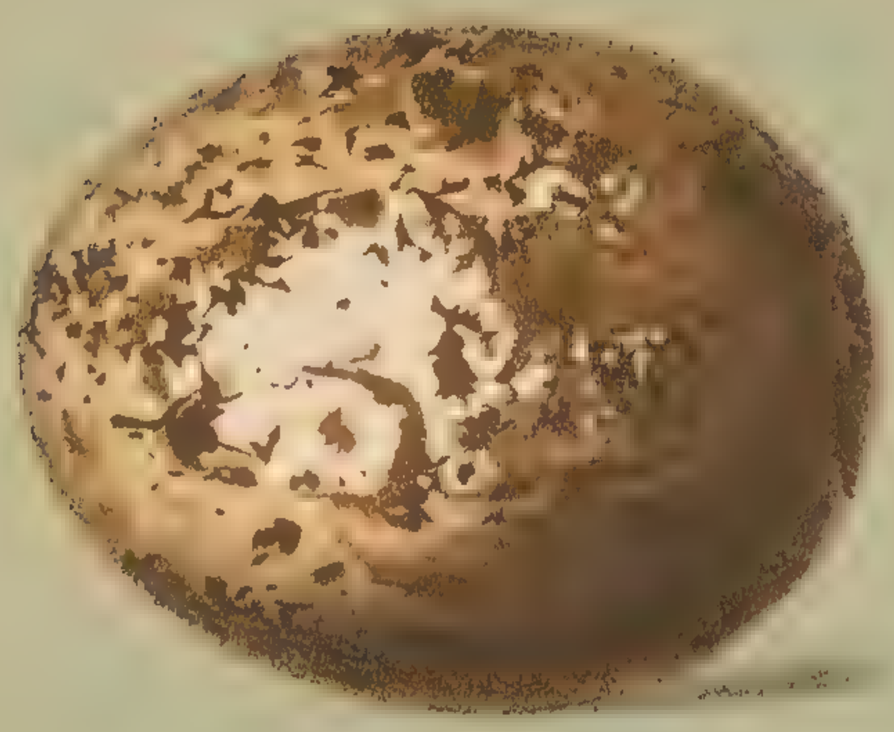

4

1–3. ELANUS CÆRULEUS, Desf.
The Black-winged Kite.

4. SPILORNIS MELANOTIS, Jerd.
The Lesser Harrier Eagle.

Brom. London

JOURNAL

OF THE

BOMBAY

Natural History Society

No. 4.] BOMBAY, DECEMBER, 1888. [Vol. III.

NESTING IN WESTERN INDIA.

By Lieut. H. E. Barnes.

Works on Indian Oology are very few, and many years have elapsed since the last was written. Colonel Marshall's book, "*Birds Nesting in India,*" was published in 1877, and although most invaluable to collectors, does not describe fully either nests or eggs, and contains but few references to this side of India. Mr. Hume's splendid work, "*Nests and Eggs of Indian Birds,*" was published in 1873, and has long been out of print. It describes in the most careful manner, both nests and eggs, of all birds known to breed in India at that time, and gives the fullest information regarding both localities and dates, but here again the references to Western India are few and incomplete. I believe that at one time Mr. Hume contemplated publishing a new and revised edition; indeed, Colonel Marshall in the preface to his work mentions having been allowed to take extracts from the manuscripts, which must at that time have been in an advanced stage. Mr. Hume having now presented his collection to the British Museum, and his time being fully taken up with another and perhaps more important subject, renders it extremely unlikely that this work will ever be published; this is to be the more regretted as it would have contained much matter especially interesting to Western Indian ornithologists. A great deal of information is contained in the *Bombay Gazetteer,* and many valuable notes are to

be found in the pages of *Stray Feathers* and other publications, not available to the general public.

The object of this paper is to collect together, in as concise a form as possible, all information available on the subject, in the hope that it will prove useful to those interested, and form a nucleus round which collectors will record their observations, and thus lead to a more complete knowledge of bird-life in Western India.

2.—THE INDIAN KING VULTURE.

Otogyps calvus, Scop.

The Indian King Vulture is more or less common throughout the district; unlike most Indian vultures, they are solitary in their habits, rarely more than two or three being seen together, the third one when present being a bird of the year which has not yet learned to forage for itself.

They are of a very quarrelsome disposition, particularly when feeding, not allowing any other creature to approach until they have satisfied their hunger.

They breed later than most of the other vultures; the middle of January being quite early enough to search for nests, which are few and far between, and long distances have to be gone over before much success can be looked for.

In some parts of the country, the birds make their nests in the tops of dense thorny bushes, about ten or twelve feet from the ground, but generally they are built on lofty trees; in the latter case the nest is of the usual platform type, but in the former they are cup-shaped.

The egg, there is only one, is very pale greenish-white in colour when first laid, but as incubation proceeds, it becomes much discoloured from the droppings of the parent birds; it is moderately fine in texture, and the lining is green; they vary in shape from a long oval to one nearly spherical, but broad ovals predominate. They measure 3·4 inches in length by about 2·6 in breadth.

Sholapur, 26th December to 1st February.	*J. Davidson, C.S.*
Nassick, 30th January to 1st March.	,,
Deesa, 14th September to 28th February.	*H. E. Barnes.*
Neemuch, 13th February to 1st March.	,,
Hydrabad, Sind, 14th March (nestling).	,,
Eastern Narra, Sind, 15th February to 15th April.	*S. Doig, Esq.*
Baroda, 15th April (nestling).	*H. Littledale, Esq.*

3 *bis*—THE BAY VULTURE.

Gyps fulvescens, Hume.

The Bay Vulture occurs not uncommonly in the northern portion of the district, where it is a permanent resident, breeding during the months of January and February, making a huge platform stick nest, on a lofty tree, and laying a single white egg, which is larger than that of either the King or the White-backed Vultures.

Baroda, 13th to 20th February, mostly young. H. Littledale, Esq.

4 *bis*—THE COMMON CLIFF VULTURE.

Gyps pallescens, Hume.

The Common Cliff Vulture occurs throughout the greater portion of the district, but has not as yet been recorded from Sind. They are permanent residents, but retire to the nearest suitable hills to breed during the cold season. They place their nests on ledges in the faces of almost inaccessible cliffs; they are both difficult and dangerous to get at, as in most cases a man has to be drawn up from below, or let down from above. The nests, although so hard to get at, are easily found, owing to the conspicuous patches of white on the cliffs near them; these patches are the accumulated droppings of the birds. The nest is a mere collection of grass or sticks; the egg, there is only one, is usually a longish oval in shape, and is dingy unspotted greyish-white in colour, but is occasionally spotted with pale rusty-red and faint purplish-brown. They vary enormously in size, but the average is 3·61 inches in length by about 2·71 in breadth.

It is only of late years that this vulture has been discriminated, it having formerly been confounded with the Long-billed Brown Vulture, *Gyps indicus, Scop.*, from which it differs in many respects.

Khandesh, 23rd December to 5th January (inc. eggs and nestlings).
J. Davidson, C.S.

Nassick, 30th December. „ „ „
Aboo, 27th December. *H. E. Barnes.*

5.—THE WHITE-BACKED VULTURE.

Pseudogyps bengalensis, Gm.

The White-backed is the commonest of our Indian vultures, breeding in all parts of the country, from early in October to about the middle of December. They breed on lofty trees, in

colonies, sometimes as many as twenty nests being found on a single tree; these nests are placed at various heights, some being not more than ten or twelve feet from the ground, whilst others are placed near the top, each branch of any size being crowned with a nest. They never lay more than one egg, and this is somewhat smaller than that of the King Vulture, measuring about 3·25 inches in length by nearly 2·4 in breadth.

It is rather coarse in texture, and the lining is deep green. Some eggs are unspotted greyish-white, but many of them are sparingly and faintly blotched with reddish-brown. Like most vulture eggs they are generally discoloured by the droppings of the parent birds.

Panch Mahals, 12th to 24th November. *J. Davidson, C. S.*
Nassick, 25th November. ,,
Deesa, 25th December to 19th February (young). *H. E. Barnes.*
Neemuch, 9th November to 2nd December (inc. eggs). ,,
Hydrabad, Sind, 4th to 10th December ,,
Eastern Narra, Sind, 15th Nov. to 15th December. *S. Doig, Esq.*
Baroda, 25th November to 20th February. *H. Littledale, Esq.*

6.—THE SCAVENGER VULTURE.

Neophron ginginianus, Lath.

The White or Scavenger Vulture is common throughout Western India, frequenting the neighbourhood of villages in preference to less populous places, for reasons indicated by its name. They breed from early in March to the end of April; the nests are solitary, and are found in various situations,—the cornices of buildings, ledges in the faces of rocky or clayey cliffs, and more commonly on trees; when in the latter situation, it is not usually placed in a fork, but is built on a large horizontal branch at its junction with the trunk. Mr. Littledale says, "they never breed on trees in Sind" (this is quite in accordance with my own experience); about Baroda always on trees; in hilly jungles on cliffs by preference. About Neemuch they always build on trees.

The nest is a large, loose untidy affair, often lined with rags. The eggs, two in number, are broadish oval in shape, of a greyish-white ground colour, beautifully streaked and blotched with deep reddish-brown; some of them are so richly marked as to leave little or none of the ground colour visible, whilst others are

comparatively plain, and occasionally even a dingy white. They vary greatly in size, but average 2·62 inches in length by about 1·96 in breadth.

Many naturalists prefer to consider this vulture as a variety, or at most a sub-species of the Egyptian vulture, *Neophron percnopterus*, Lin. This latter breeds at Chaman, South Afghanistan.

The eggs are considerably larger but less highly coloured than those of the Indian bird.

Eastern Narra, Sind, March and April.	*S. Doig, Esq.*
Hydrabad, Sind, 22nd March to 22nd April.	*H. E. Barnes.*
Deesa, 20th March to 15th April.	,,
Neemuch, 18th March to 29th April.	,,
Panch Mahals, 9th March.	*J. Davidson, C. S.*
Khandesh, 2nd March.	,,
Nassick, 2nd to 22nd March.	,,
Baroda, 3rd to 17th March.	*H. Littledale, Esq.*

9.—THE SHAHIN.

Falco peregrinator, Sund.

The Shahin is the least common of our resident falcons, but it occurs in suitable localities throughout the region, its favourite resort being the neighbourhood of high rocky hills, where it breeds, choosing a hole in the face of an almost inaccessible cliff. I have never been able to secure an egg, but I saw a pair making preparations for breeding near the waterfall at Patelpani, close to Mhow, the very same place where, years ago, Jerdon found an eyrie. Colonel Butler reports another eyrie at Khandala, and Mr. Davidson, C. S., West Khandesh, found a nest containing three fully fledged young ones in May, so that most probably the eggs were laid in March or early in April. He has also seen an eyrie at Matheran. The egg is said to resemble that of the Laggar Falcon, but to be somewhat narrower and not so highly coloured, but as the description was admittedly taken from a single egg it may not hold good in all cases.

They are great game destroyers.

11.—THE LAGGAR FALCON.

Falco jugger, J. E. Gr.

The Laggar is our commonest falcon, being generally distributed throughout the entire district; they nest indifferently on trees, on

ledges in the faces of cliffs, cornices of buildings, &c. In the first case, they usually appropriate the deserted nest of a Tawny Eagle or other bird. Most of them lay in the latter half of January and in February, but eggs are occasionally found in March. The nest is composed of small sticks and twigs ; the eggs, four in number, are nearly perfect ovals in shape, somewhat chalky in texture, and are of a dingy yellowish-brown colour, clouded, mottled, and blotched with reddish-brown. When first taken they are often highly coloured, but if exposed to light soon fade. They average rather more than two inches in length by about 1·57 in breadth.

Sholapur, 4th January to 9th March.	*J. Davidson, C.S.*
Khandesh, 22nd January.	,,
Neemuch, 30th January to 27th February.	*H. E. Barnes.*
Hydrabad, Sind, 12th February to 15th March.	,,
Poona, 6th May (fledged nestlings).	,,
E. Narra, Sind, 10th to 15th February.	*S. Doig, Esq.*

16.—THE RED-HEADED MERLIN.

Falco chiquera, Daud.

The Turumti or Red-headed Merlin is common throughout the district, frequenting open country in the neighbourhood of cultivation, preying chiefly on small birds and mice. It breeds during February and March, making its nest in a fork near the top of a densely foliaged tree ; it is cup-shaped, neatly and compactly made, and is composed of sticks and twigs lined with grass roots. The eggs, four in number, are not unlike those of the Laggar Falcon, but are of course much smaller. Some of them are dingy yellowish-brown in colour, spotted and freckled with darker brown, but often they are of a deep red colour ; these last are very beautiful. They average 1·66 inches in length by rather more than 1·26 in breadth. The nest would often remain undiscovered were it not that the birds are so noisy and pugnacious during the breeding season, sallying out and attacking any bird approaching the nest, no matter how large, not hesitating even to attack a Tawny Eagle, should one intrude.

Sholapur, 27th February to 1st March.	*J. Davidson, C.S.*
Khandesh, 14th February.	,,
Nassick, 15th February to 29th March.	,,
Deesa, 2nd March to 3rd April (inc. eggs).	*H. E. Barnes.*
Hydrabad, Sind, 15th March.	,,
Eastern Narra, Sind, 16th April.	*S. Doig, Esq.*

17.—THE KESTREL.

Cerchneis tinnunculus, Lin.

Most of the Kestrels found in Western India are cold weather visitants only, retiring to the mountain ranges to breed, many of them leaving the country altogether for this purpose. They are known to breed on the Nilgiris, and Mr. Davidson, C.S., found nests containing young in May on the Ghats in the Nassick district. I am indebted to him for the following interesting note:—"This is, as a "rule, a migrant, but a fair number breed all along the ghats in the "Nassick district. I have never taken the eggs, but I have shot the "young on the sides of the cliffs while unable to fly. They breed in "holes in the cliffs, and as there are a great many holes equally "suitable, the nests are hard to find. To get at them one party has "to stay below the cliffs, probably 200 feet from the top, and "another with a rope ladder above. As the holes in which the bird "nests are very deep and often 100 feet from the top, it is simply "luck to find the right one, and one in a position that the man let "down the cliff can reach."

They breed very commonly in the Bolan Pass and on the Khoja Amran Mountains in Southern Afghanistan.

At this latter place I found many nests. The nest is generally on a ledge or in a hole in the face of a cliff, but I once took four eggs from a nest that originally belonged to a common magpie.

The nest is of no particular shape, often taking the form of the place in which it is built; it is composed of small twigs, and all those that I have seen have been unlined. The eggs, four in number, rarely five, are broad ovals in shape, somewhat compressed at one end. The colour varies from light to dark brick or blood-red, mottled, blotched, and freckled with darker shades of the same colour, but yellowish-brown varieties also occur. They measure 1·58 inches in length by about 1·2 in breadth.

Chaman. *H. E. Barnes.*

Nassick, May. Nestlings. *J. Davidson, C.S.*

23.—THE SHIKRA.

Astur badius, Gm.

Of the many hawks that occur in India, the Shikra is perhaps the commonest, and is the only one that is known to breed in our

district, though most probably one or two of the others do so on the higher mountain ranges.

The Shikra breeds during April and May, making a shallow cup-shaped nest, rather smaller than that of the Turmuti, and not so neatly or so compactly built; like the latter it is composed of sticks and twigs, lined with grass-roots; it takes them a very long time to build it.

The eggs, three or four in number, are oval in shape, and measure 1·54 inches in length by about 1·23 in breadth. In colour, they are pale, glossless, bluish-white, unmarked, as a rule, very rarely with a few pale brown blotches.

Neemuch, 2nd to 30th April. *H. E. Barnes.*

Much too common to need further details.

28.—THE SPOTTED EAGLE.

Aquila clanga, Pall.

I have never found this bird breeding, but am indebted to Mr. J. Davidson, C.S., for the following interesting note:—

"Not uncommon in the Tapti Valley, breeding in the hot "weather in high trees, along the water courses coming out of "the hills. The nest is placed in a fork, not near the top of the "tree, but very similar in position to that of *I. cirrhatus*; it is "however smaller. The birds so far as I have been able to observe "lay but a single egg."

Khandesh, 13th April, 2 single eggs. *J. Davidson, C.S.*

29.—THE INDIAN TAWNY EAGLE.

Aquila vindhiana, Frankl.

The Tawny Eagle is fairly common throughout Western India, except perhaps in the more densely-wooded or marshy tracts; they breed from about the end of October up to the middle of March, but most eggs will be found during the months of December and January.

The nest which is flat is composed of sticks, lined with green leaves, and is placed on the small branches near the top of a high tree, occasionally in a fork; the eggs, two in number, seldom three, are subject to much variation in size and shape, but are usually a broadish oval, slightly narrower at one end; the average of a large number measured was 2·62 inches in length by nearly 2·12 in

breadth; the texture is fine, and the lining pure sea-green. In colour the eggs are greyish-white, more or less spotted with brown and reddish-brown; sometimes the markings are bright and well defined, but as a rule they are not richly coloured.

Neemuch, 20th November to 2nd March. *H. E. Barnes.*

Too common for further details.

30.—THE LONG-LEGGED EAGLE.

Aquila hastata, Less.

Mr. J. Davidson, C.S., has kindly furnished me with the following note :—

"This was the common eagle of Central Mysore, and no doubt "extends northwards into the Belgaum district. I took a nest in "Mysore on the 13th March 1877, which contained one very bril- "liantly coloured egg. The bird which I shot would have laid "another the next day; the nest had apparently been a large one, "but was blown down, and the egg was laid on a heap of sticks, not "as big as an ordinary nest of the Shikra; it was in a fork and "not in the branches of a tree."

33.—THE CRESTLESS HAWK EAGLE.

Nisáétus fasciatus, Gm.

The Crestless Hawk Eagle occurs throughout the district, but is nowhere common. They breed principally during December and January, but eggs are occasionally found early and later. They nest, as a rule, on ledges of rocky cliffs, which are often very difficult of access, owing to the site chosen being under a projecting crag, but sometimes they breed on trees. The nest when on a cliff is a small one, but when on a tree it is of an enormous size; it is composed of sticks lined with green leaves. The eggs, two in number, are moderately broad ovals, measuring 2·75 inches in length by about 2 in breadth; they are pale greyish-white in colour, sometimes unspotted, but are generally thinly marked with yellowish or reddish-brown spots. They are seldom if ever richly-coloured. This bird does not use the same nest yearly; it seems to have two or three eyries in the same neighbourhood, and breeds in one of them.

Sholapur, 15th January. *J. Davidson, C. S.*

Khandesh, 24th Dec. to 5th January. (Cliffs.) „

35.—THE CRESTED HAWK EAGLE.

Limnáétus cirrhatus, Gm.

The Crested Hawk Eagle is confined to the hilly tracts of the district, and appears to be uncommon everywhere, except perhaps in Ratnagiri.* They breed during the first three months of the year, making a large stick nest high up in a fork of a lofty tree; it is usually lined with green leaves. They lay but a single egg, which is white, devoid of markings; the lining is pale green, and it measures 2·65 inches in length by 1·9 in breadth.

Although they allow no other bird to build on or near the tree in which they have placed their nest, yet they make no attempt to defend it from the attack of a bird-nester, and forsake it on the least provocation.

They are a long time making their nest, and it is often finished weeks before the egg is laid.

Khandesh, 16th February to 13th April. — *J. Davidson, C.S.*
S. Kanara, December to April. — *C. Vidal, C.S.*

38.—THE COMMON SERPENT EAGLE.

Circáétus gallicus, Gm.

The Common Serpent or Short-toed Eagle is sparingly distributed throughout the greater part of Western India, but has not as yet been recorded from Ratnagiri. They are permanent residents breeding during the first three months of the year, placing their nests as a rule on trees, more rarely on ledges in the faces of rocky ar clayey cliffs.

The nests are rather large, and are composed of sticks, sometimes with grass intermixed, and they are often lined with green leaves.

The egg, they lay but one, is broad oval in shape, slightly tapering at one end; it varies a good deal in size, but the average is 2·9 inches in length by about 2·3 in breadth; it is unspotted bluish-white in colour. The egg lining is a beautiful sap-green. Although they frequent the neighbourhood of the nest for a long time after it has been robbed, they do not appear to lay a second time. This Eagle is the Jean-le-blanc of the French, so called from its beautiful white breast.

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* Mr. Davidson, C.S., found this to be the common Eagle of W. Khandesh. *Vide* B. N. H. S. Journal, p. 194, No. 4, Vol. I.

Mr. Davidson, C.S., found it breeding east of Sholapur, on cliffs, in December and January.

Neemuch, 2nd March. *H. E. Barnes.*

39.—THE CRESTED SERPENT EAGLE.

Spilornis cheela, Lath.

The Crested Serpent or Indian Harrier Eagle is very rare, but specimens have been obtained from several widely separated localities within the limits of the Presidency.

* A specimen in the Bombay Natural History Society's collection bears a label, stating that it was shot off the nest, which contained but a single egg.

The nest is placed in a fork halfway up a tree, always in the neighbourhood of water; it is made of sticks and twigs, lined with grass and green leaves. The egg, they do not appear to lay more than one, is generally of an oval shape, rather smaller at one end; the colour is *greenish-*, *bluish-*, seldom reddish-white, and is more or less spotted and blotched with reddish or purplish-brown. They are occasionally very richly coloured.

Mr. Hume found the eggs to average 2·78 inches in length by nearly 2·2 in breadth. They breed during the hot season.

39 *bis.*—THE LESSER HARRIER EAGLE.

Spilornis melanotis, Jerd.

The Lesser Harrier Eagle is not uncommon in the Ratnagiri district, and is sparingly distributed in the hilly tracts and jungles along the Western Ghats, where it is said to breed during the hot weather, both nest and eggs being of the same type as those of the larger and better known Serpent Eagle, *Spilornis cheela*, but the eggs, occasionally at least, are two in number, and are smaller.

Not much is known at present regarding the nidification of this interesting bird.

It is considered by many to be only a sub-species of *S. cheela*, but I believe an examination of the specimens in Mr. A. O. Hume's collection (now in the British Museum), would result in its re-establishment as a good species.

S. Konkan, 18th to 20th March. *G. Vidal, C.S.*

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* This specimen wss shot by Mr. H. Littledale, at Pattra, Panch Mahals, 12th April, 1886. *Vide* B. N. H. S. Journal, p. 195, No. 4, Vol. I.

42.—THE INDIAN RING-TAILED EAGLE.

Haliáétus leucoryphus, Pall.

The Indian Ring-tailed or Fishing Eagle is very common in Sind, and occurs, but more sparingly, in Guzerat and Rajpootana.

They breed during November, December and January, making a huge stick nest, high up in a tree, always in the immediate vicinity of water. As the birds use the same nest year after year, it is often of immense size, some of the sticks composing it being as thick as a man's arm. They make no attempt to defend their nest while it is being plundered, and if the eggs are taken, will lay another clutch within a fortnight.

The eggs, two or three in number, as often one as the other, are usually broad ovals in shape, averaging 2·8 inches in length by about 2·17 in breadth; they are unspotted white in colour, but get much soiled as incubation proceeds.

Hydrabad, Sind, 25th Nov. to 3rd Jan. — *H. E. Barnes.*
E. Narra, Sind, November and December. — *S. Doig, Esq.*
Baroda, 26th November. — *H. Littledale, Esq.*

43.—THE GREY-BACKED SEA EAGLE.

Haliáétus leucogaster, Gm.

The Grey-backed Sea Eagle appears to be restricted to the Sea Coast and a few miles up the larger rivers; it does not occur in Sind.

They nest during November and December on trees, which they occupy continuously, whether breeding or not.

The ground beneath the nest is strewed with snake and fish bones, and other *debris*. Dr. Jerdon, in the *Birds of India*, gives a good account of a colony he visited at Pigeon Island, and Mr. Vidal a still better one in his *Ratnagiri Birds*, written for the *Bombay Gazetteer*.

The eggs, two in number, are unspotted white, measuring about 3 inches in length by 2·06 in breadth.

These eagles do not restrict themselves to a snake or fish diet, but occasionally help themselves to a fisherman's fowl.

S. Konkan, October to December. — *G. Vidal, C.S.*

48.—THE WHITE-EYED BUZZARD.

Butastur teesa, Frankl.

The White-eyed Buzzard is common in all parts of the district, except in Ratnagiri and the more densely-wooded tracts, where it is rare. It is a permanent resident, wherever it occurs, breeding

much later than most other members of the family, the month of April being the best to search for eggs.

The nest is placed in a fork high up in a densely-foliaged tree, usually an outer one of some small clump, and is rather a loose untidy affair, composed of sticks and twigs, and is unlined. It is often completed long before the birds are ready to lay.

The eggs, three in number, occasionally only two, much more rarely four, are broad oval in shape, and unspotted greyish or bluish-white in colour, averaging rather more than 1·8 inches in length by 1·53 in breadth. The egg lining is sea-green. The birds hang about the nests for days after it has been robbed, and sometimes lay again. They build a new nest every year.

Neemuch, 5th April. *H. E. Barnes.*

They are too common to need further details.

55.—THE BRAHMINY KITE.

Haliastur Indus, Bodd.

The Maroon-backed or Brahminy Kite is distributed more or less commonly throughout the district, but is much more plentiful on the sea coast and in the vicinity of the larger rivers.

It breeds during the first three months of the year, making its nest on any large tree, as a rule in the immediate vicinity of water, cocoanut palms when available being preferred; it is composed of sticks, and is generally unlined.

The eggs, two in number, are moderately broad oval in shape, averaging about 2 inches in length, by nearly 1·65 in breadth; they are greyish-white in colour, feebly spotted with pale dingy and reddish-brown. They are rather smaller than those of the Common Kite. They do not defend their nests from the assaults of the bird-nester, and desert them on the least provocation.

E. Narra, Sind, 4th April. *S. Doig, Esq.*
Hydrabad, Sind, 3rd March. *H. E. Barnes.*
Bombay, 2nd February. ,,
Khandesh, 29th January. *J. Davidson, C.S.*
Nassick, 4th December to 16th January. ,,
S. Konkan, January to March. *G. Vidal, C.S.*

56.—THE PARIAH KITE.

Milvus govinda, Sykes.

The Common or Pariah Kite is abundant throughout Western India; it has a most extensive breeding season, commencing early

in September, and eggs have been taken as late as the middle of April, but November and February are the months in which most eggs will be found. It is very probable that they breed twice in the year. They are by no means fastidious in selecting a site for a nest, but commonly a fork, high up in a tree, or a flat branch at its junction with the trunk is chosen, no matter whether it is situated in the open jungle, in a compound, or in the very midst of a village or town. A tree in the vicinity of a meat market is often selected, and the cornice of a building is sometimes made use of, but this latter not often, except perhaps in a place like Karachi, where suitable trees are rare. The nest is an untidy mass of sticks and twigs, lined with leaves, rags, or any other available rubbish. The eggs, two in number, often three, are oval in shape, and average 2·2 inches in length by about 1·77 in breadth. They are greyish-white in colour, spotted, speckled, streaked, blotched, clouded, or mottled, with various shades of brown and red. Some few of the eggs are almost unmarked but occasionally they are handsomely and richly coloured, having blood-red blotches clearly defined on a white ground; between these two extremes every possible variety occurs. They are very fierce in the defence of their nests, especially when they contain young or much incubated eggs, swooping down and striking the climber with wings and claws. They are good and useful scavengers, but are nevertheless a great nuisance, especially near a poultry yard, having a predilection for young chickens, and they often succeed in carrying off a sickly half-grown fowl.

They infest camps, and seem to know the time for dinner or other meals, being much more numerous and active at these times than at others; a piece of meat left exposed for a moment is certain to be carried off, the successful marauder being closely followed by his fellow kites, each eager to take it from him, and the coveted morsel changes owners many times before it is finally disposed of.

The nests are too common to need detailed dates.

57.—THE HONEY BUZZARD.

Pernis ptilorhynchus, Tem.

The Honey Buzzard is comparatively rare, only occurring as a straggler throughout the greater portion of the district, but in the Deccan and more eastern parts of the Presidency it is less uncommon.

Messrs. Doig and Littledale found a nest, one egg, at Singargarh, near Seonth, Panch Mahals, on the 25th April 1886. The egg was white, faintly marked with brown at the larger end. *Vide B. N. H. S. Journal*, p. 195, No. 4, Vol. I.

It is probably a permanent resident in those places in which it occurs, breeding during the hot season, making its nest on trees, at some height from the ground. The nest is neatly and compactly built, well lined with dead leaves. The eggs, two in number, are broad oval in shape, many of them being almost spherical; they measure about 2 inches in length by 1·72 in breadth. The ground colour varies from white to buffy-white, and the markings (consisting of blotches, clouds and mottlings) vary from reddish-brown to deep blood-red. They are as a rule very richly coloured. The shell is thin and brittle, smooth in texture, and usually quite devoid of gloss; the egg lining varies from greenish-white to dingy yellowish green.

Mr. Davidson says, *in epis*: "I think it breeds very sparsely "in this Presidency. I took a nest in Mysore, on the 14th February "1878, and I have had eggs sent me from Tanna, taken, I believe, "in March. The nest I took was quite invisible from below the "tree, and was high up in a thick mango. I saw the bird carrying "sticks into the tree, otherwise I should never have found the "nest."

59.—THE BLACK-WINGED KITE.

Elanus cæruleus, Desf.

The Black-winged Kite is distributed generally throughout the plain portion of the Presidency, sparingly in the north but becoming more common in the Deccan. It breeds at the close of the year, building a neat compact stick nest, lined with grass, in a fork in the upper portion of a tree. The eggs, three or four in number, are broad oval in shape, measuring about 1·5 inches in length by a little less than 1·2 in breadth; they are greyish or creamy-white in colour, mottled and clouded with various shades of reddish-brown and dingy-red, occasionally approaching to blood-red; they are rather chalky in texture, and the egg lining is pale sea-green.

Mr. H. Littledale found a nest containing three incubated eggs at Tandalja, two miles from Baroda, on the 23rd October 1885, and a nest with young birds early in the same month.—*B. N. H. S. Journal, page* 30, *No.* 2, *Vol. I.*

Mr. Davidson, C.S., notes that the birds were very common during the season of 1878 to 1879, at Sholapur, Poona, and Khandesh; I also found it not uncommon at Deesa about the same time. Mr. Davidson has taken many nests at Sholapur and Khandesh, and he remarks that the nests were generally on small babool trees, from fifteen to twenty feet from the ground, but occasionally high up in a tree.

Sholapur, 20th September to 4th April. *J. Davidson, C.S.*
Khandesh, 7th November. ,,

60.—THE INDIAN SCREECH OWL.

Strix javanica, Gm.

The Indian Screech Owl is more or less common throughout the whole of Western India, less so in Sind and the North, more so in the Deccan and the South. They breed during December and January, occasionally later, in holes, in trees, wells and buildings, making no nest. The eggs are less spherical in shape than those of owls usually are, averaging 1·69 inches in length by about 1·28 in breadth; in number they vary from four to eight; probably when more than four are found, they are the joint produce of two birds.

In colour they are unspotted white, with just a faint tinge of cream. The texture is fine and compact, and they have but little gloss.

Deesa, 16th January. *H. E. Barnes.*
Satara, 25th February. *J. Davidson, C.S.*
Khandeish, 1st December to 1st February. ,,

65.—THE MOTTLED WOOD OWL.

Syrnium ocellatum, Less.

With the exception of Sind, the Mottled Wood Owl has been recorded from all parts of the Presidency. It is, however, somewhat locally distributed, not occurring as a rule in heavy forest, but much affecting small topes of trees in the vicinity of villages. It breeds during January and February, occasionally later, laying its eggs in holes in trees, or in a depression formed by one or more branches; it makes no nest. The eggs, two in number, are very broad ovals, measuring nearly two inches in length by about 1·67 in breadth. They are unspotted white in colour, many of them having a barely

perceptible creamy tinge. The eggs are very large for the size of the bird.

Khandeish, 10th Dec. to 12th February.	*J. Davidson, C.S.*
Nassick, 16th Dec. to 28th February.	,,
Saugor, 20th Nov. to 4th January.	*H. E. Barnes.*
S. Konkan, January.	*G. Vidal, C.S.*
Baroda, March.	*H. Littledale, Esq.*

69.—THE ROCK-HORNED OWL.

Bubo bengalensis, Frankl.

The Rock-Horned Owl is common in suitable places throughout the district, with the exception of Sind, where it appears to be rare. It frequents river banks and nullahs, breeding from January to about the middle of March; but eggs are occasionally found both earlier and later. It makes no nest, but lays its eggs in a depression on the ground, under the shelter of a rock. They are three or four in number, rarely five, and are nearly perfect ovals in shape, measuring 2·1 inches in length by 1·73 in breadth. They are small for the size of the bird. In colour they are white, with a faint creamy tinge; they scarcely differ from those of the Mottled Wood Owl.

Sholapur, 6th to 12th December	*J. Davidson, C.S.*
Khandesh, 25th November to 29th February.	,,
Nassick, 22nd January.	,,
Poona, 14th February.	*H. E. Barnes.*
Neemuch, 2nd March to 27th April.	,,
Baroda, March.	*H. Littledale, Esq.*

70.—THE DUSKY HORNED OWL.

Bubo coromandus, Lath.

The Dusky Horned Owl is common in the northern portion of the Presidency, but appears to be absent from the South. It greatly affects mango topes in the vicinity of villages and along the banks of rivers and canals. It breeds as a rule during the months of December and January, but eggs are often found much later. The nest is usually of large size, owing to its being used during many successive seasons. It is composed of sticks, and is generally placed in a stout fork in a lofty and densely-foliaged tree, but is occasionally built on a flat horizontal branch, or in a depression at the junction of a branch with the trunk. The eggs, two in number, are coarse in texture, and faint creamy-white in colour; typically

they are broad ovals, but vary much both in shape and size ; they average 2·33 inches in length by about 1·89 in breadth.

Khandeish, 2nd January. — *J. Davidson, C.S.*
Neemuch, 7th December to 5th January. — *H. E. Barnes.*
Hydrabad, Sind, 14th December. — ,,
E. Narra, Sind, December — *S. Doig, Esq.*

72.—THE BROWN FISH OWL.

Ketupa ceylonensis, Gm.

The Brown Fish Owl is rare in the north, but becomes more common towards the south. Its usual haunts are in the thick jungle along the banks of rivers and streams. It breeds from January to March. The nest is found in a variety of situations, in a hole in a tree, in a hollow in the fork of a tree, in a deserted Fishing Eagle's nest, or even on a ledge in the face of a cliff on the bank of a river. The eggs, two in number, occasionally three, are broad oval in shape, white in colour, with a barely perceptible creamy tinge. They average about the same size as those of the Dusky Horned Owl, from which they are not distinguishable. A fresh and an incubated egg will often be found in the same nest, owing to the female commencing to sit as soon as the first egg is laid. This habit seems to be general amongst the the owls. The diet of these birds is not confined so exclusively to fish as is so generally supposed.

Satara, 14th February. — *J. Davidson, C.S.*
Khandeish, 19th January. — ,,
Nassick, 16th January. — ,,
S. Konkan, Jan. to March. — *G. Vidal, C.S.*

75 *ter*.—THE LARGE SCOPS OWL.

Scops bakkamuna, Forst.

The Large Scops Owl occurs, but is by no means common in Sind, Rajpootana, and some parts of Guzerat, but has not as yet been recorded from the more southern parts of the district.

It breeds from January to March, making a scanty nest of dead leaves and feathers in a hole in a tree.

The eggs, two in number, are very spherical in shape, measuring 1·25 inches in length by about 1·05 in breadth. They are pure glossy white in colour.

Khandeish, 11th Dec., inc. eggs and nestling, — *J. Davidson, C.S.*
Nassick, 19th March, fully fledged young. — ,,

75 *quat.*—THE MALABAR SCOPS OWL.

Scops malabaricus, Jerd.

The Malabar Scops Owl occurs not uncommonly in Ratnagiri, but does not appear to have been recorded from any other district in Western India.

It frequents thick groves and cocoanut gardens. It is a permanent resident where it occurs, breeding very early in the year in holes in trees.

The eggs, three to six in number, are glossy white in colour, and are almost spherical in shape.

S. Konkan, Jan. and February. *G. Vidal, C.S.*

76.—THE SPOTTED OWLET.

Carine brama, Tem.

The Spotted Owlet is common throughout Western India, except on the ghats and in the adjacent forest country; it appears to be absent from Ratnagiri, or at most to be exceedingly rare. It is a permanent resident, breeding during March and April. It is not particular in its choice of a site for a nest. An old decayed tree will afford a lodging for several pairs; in fact, holes in trees are their favourite nesting places, and they may often be seen peeping out even in the middle of the day. Holes in wells, in old buildings, in walls, under the eaves of houses, and holes in haystacks are each and all made use of by this very accommodating bird. They do not make an elaborate nest, a few dead leaves, pieces of grass and feathers thrown together anyhow, suffice for their requirements. The eggs, four in number, are often found in different stages of incubation; they are pure white in colour, and are rather broad ovals in shape, measuring 1·25 inches in length by about an inch in breadth.

This bird is too common to need detailed dates.

76 *quint.*—HETEROGLAUX BLEWITTI, *Hume.*

Mr. Davidson, C.S., found this bird to be a permanent resident in the plains jungle, north of the Tapti, but never found a nest.

77.—THE JUNGLE OWLET.

Glaucidium radiatum, Tick.

The Jungle Owl appears to be absent from Sind. It occurs in the jungle at the foot of Mount Abu, and through the Panch Mahals,

and is not uncommon on the Khandeish hills. At Ratnagiri it is replaced by a bird intermediate between it and the Malabar Owlet.

It breeds during April and May, much in the same manner as the Spotted Owlet does, and the eggs do not differ in any respect from those of that bird.

Abu, 28th April, nestlings. *H. E. Barnes.*
Khandeish, 14th April. *J. Davidson, C.S.*
Nassick, 25th April to 21st May. ,,

78.—THE MALABAR OWLET.

Glaucidium malabaricum, Bly.

Typical specimens of the Malabar and Jungle Owlets differ considerably, but these differences are bridged over by so many intermediate forms, that it seems doubtful whether the one is anything more than a local race or variety of the other. The owlets of Ratnagiri and the southern portions of the district generally approach nearer to the type of *G. malabaricum* than they do to that of *G. radiatum*; it is better, therefore, for the present to consider them as distinct.

It is a permanent resident, breeding during March and April, laying its eggs, which are indistinguishable from those of the Spotted and Jungle Owlets, in holes in trees.

They seem more diurnal in their habits than other members of the family usually are.

S. Konkan, 14th April. *J. Vidal, C.S.*

NOTES ON SAMBHUR AND SAMBHUR STALKING.

(*Read at the Society's Meeting on 6th August* 1888.)

By Mr. Reginald Gilbert.

My experience of the sambhur are confined to what I have seen of him in the Central Provinces, Central India, and the Bombay Presidency, and to one place in Australia where he has been successfully introduced. I have always shot them whilst stalking, and it is my boast that, although I have often had the opportunity, I never demeaned myself by shooting a sambhur in a drive. The time of the year I have devoted to the sport has been the Christmas vacation, and I have spent seven Christmas holidays stalking in the

Satpuras, at and near the Taptee River. The greatest bag I have ever made of sambhur was seven sambhur in six days during Christmas, 1879, and my lowest bag for the same period has been *nil*, working over the same ground and with equal opportunities. On the latter occasion my companion scarcely ever missed a day without getting a shot at a good stag, whilst I had but one shot the whole trip, which I missed. You will thus see there is a great element of chance in stalking. In December and January the sambhur are not in the hills, but inhabit the huge jungles which are found in the Satpuras generally within a mile or two of cultivation. In the night they wander sometimes into the cultivation near the jungle, or feed on favourite berries in the jungle itself. About 9 A. M., they retire into thick shade, more often in nullahs or at the tops of nullahs, and remain lying down till about 4 P. M. The jungle being thick and the grass high at this time of the year the sambhur is difficult to see, and if he remains in view for any period the branch of a tree or some high grass may spoil the sportsman's aim. Sometimes, however, he presents an easy shot. I have occasionally walked quite on to them sleeping in a nullah in the middle of the day. The sambhur then rises hurriedly and makes off as fast as he can go. On the other hand if the sambhur hears one at a distance of 100 or 200 yards he rises and takes a good look to see who it is before making his rush.

AN ADVENTURE.

I do not propose to give you a scientific dissertation on the sambhur; but only a few notes of unusual adventures I have had out sambhur stalking taken from my shikar diary, written on the spot and at the time of their occurrence. My practise is to go with a small tent and as little kit as possible, taking with me all supplies for self and men. Sometimes I have had a companion with me, but more often I have gone alone. Even if one has a companion, he goes out in a different direction, so that one sees little of him except at night. I make one shikaree walk in front of me and one immediately behind, 50 yards or so behind. I have two other spare trackers or shikarees of sorts. Behind these a coolie carrying my photographic kit, and still further behind him my pony and a man carrying the tiffin basket. From dawn till 10 a. m. I work. I then find a cool place near water, where I stay till 3 p. m. My men always cook and eat their morning meal at this period. From 3 p.m.

till dark I stalk along towards camp, and generally time myself to arrive in camp just before dark. At Christmas the jungles are probably feverish, and camped as one is in the heart of the jungle, there is no doubt great danger of catching fever; but I have been singularly fortunate in avoiding it. I know no scenery more delightful than the jungles at the edge of the Satpuras in the neighbourhood of the Taptee River. At Christmas time the leaves of the trees show the gayest of tints, the grass is not yet dried up, and the whole jungle is closely watered with babbling brooks and nullahs of cool sparkling water. The climate, too, is delightfully cool except at midday. There are always a few tigers, bears, and panthers at this time, and although the jungle renders it almost impossible to shoot them, still I have had more than one adventure with these animals on my stalking trips. To a man fond of wild jungle life, I know of no more exhilarating amnsement than a trip of this kind. Full accounts of this kind of sport and of this country will be found in Forsyth's "Highlands of Central India." Now for an adventure.

On the 30th December, 1884, in the early morning, whilst out with Mr. E. M. Slater, of this Society, we came across a fine stag sambhur on the edge of the Taptee, half eaten by tigers. The ground was soft around, and the marks of a tigress and cubs were only too evident. In fact, they had only left the kill on our coming up it was certain, because we heard a sambhur belling at a short distance from us, the sure and certain sign of a tiger. Now I must leave the sambhur to speak about this tigress. The Taptee at this spot was very deep and at least 100 yards wide. We found that the tigress had dragged the sambhur up from the river, and the marks were very plain. On our next day asking a native close by who was tending cattle, he told us the tigress had killed on the other side of the river and swam across with the sambhur. We asked why the tigress had done this instead of eating on the other side of the river, to which he gave a very satisfactory reply, that the bank on the other side was bare and very steep, and in order to hide the kill from vultures, the tigress had to bring the sambhur across the river, the bank being too high and steep for the tiger to drag it up to the thick jungle at the top of the bank on the other side. We could not go across the river to absolutely verify this statement, but we could see with our glasses the marks where the sambhur appeared to have been dragged into the river down the steep bank on the other side, and there were the undoubted marks of its being dragged out

of the river by the tigress and killed on the side on which we stood. Our shikarees, most of them Bheels, assured us it was a fact, and appeared to consider the feat of a tiger swimming across the Taptee with a sambhur as nothing very wonderful. Whether the cubs had swum across, or whether the tigress had killed on the other side of the river and dragged the sambhur across to her cubs to eat we could not say, but it seemed to us a wonderful thing, that this tigress in the cold weather should take such a long swim, dragging a stag sambhur with her. The sambhur might, however, have become inflated with gas, which would render the task of dragging it across the river an easy one. To return to the sambhur we left belling. We proceeded as quickly as we could to this in the hope of getting a shot at the tigress. We marched up to within thirty yards of a sambhur hind standing at the top of a broad dry nullah, covered with vegetation from top to bottom. The sambhur continued belling without taking the slightest notice of us, and was answered by other sambhur on the other side of the nullah. We took little notice of the sambhur, as we hoped by waiting still we should catch a glimpse of the tigress in the nullah below and get a shot. After anxiously waiting a few minutes, and hearing and seeing nothing of the tigress, we went even nearer to the hind, which made off. On the other side of the nullah, about eighty yards off, was a fine stag sambhur with three or four hinds also belling. We watched this stag for some time determining to fire at him as soon as we were assured the tigress was not in the nullah. We attempted no concealment ourselves, but the sambhur seemed perfectly panic-struck and appeared to look for no danger from our side. After a short time the stag walked slowly down the nullah, and then came up on our side and in our direction. I whispered to my companion the tigress had left the nullah or the sambhur would never have gone in the nullah, and suggested he should now kill the stag. He fired and hit too. Subsequent proceedings, however, will not interest you, although I have another little story about that tigress and her cubs, which I dare not tell you because I should digress from the subject of this paper. We afterwards went down into the bottom of the nullah and found the tigress and her cubs had gone along the nullah quite close to the sambhur.

THE LARGEST SAMBHUR ON RECORD.

Now for the largest stag sambhur on record. My experience

teaches me that the sambhur in the Satpuras are the largest in those parts of India of which I have any knowledge. I have never seen the head of a sambhur from the Ghauts or the Concan of any size. They always have appeared dwarfed. It is true I have not seen many from those parts. In fact, there are but a few, and those are fast disappearing. I hope you will pardon my absence of modesty when I tell you that, so far as I can discover, I have seen and knocked the horn off the biggest sambhur in the world. The horn is here, and has been given by me to this Society. On the 27th December, 1886, when stalking with Mr. Barton near the Taptee River, a few miles from Asirghur, in the Central Provinces, I put up a monster stag sambhur out of a thick nullah. It ran down the nullah. I was standing on the top. I only saw him for a second or two, and had only time to take a snap-shot at him before he passed round a bend in the nullah. The shell hit his horn from behind and knocked it off, splitting it up as you see. I picked the horn up and here it is. I never saw that sambhur again; but to the last day of my life I shall never forget him or cease to regret I missed him. The horn you see is broken off just above or in the neighbourhood of the brow antler, and it measures from the broken end to the tip of the longest point along the outside 44½ inches. The horn being broken off above the brow antler, I can fairly assume the length of the horn was nearly, if not quite, 50 inches. The end of the horn where the split is appears slightly turned up, as though this were near the base of the horn. This, however, cannot be, as will be easily seen if the horn is held up in the right position. I shot at the stag running away. The mark where the 500-bore express shell hit the horn is plainly visible. This proves the horn to be the left horn, and also satisfies me that the end of the split portion is turned up at the spot where the brow antler joined. The top antler of this horn is 22 inches long. This gives the great length to the horn. I have been searching up authorities to find out the biggest horn on record. I find that in the *Asian* of 1884, especially the number of 20th August, 1884, the subject of the length of sambhur horns is fully discussed. The *Asian* states the largest pair of horns on record are those known as the Coromanded Coast horns in the Calcutta Museum, and gives an illustration of them. The *Asian* appears to consider the largest to mean the heaviest in weight. The length of the longest beam of these horns is 41½ inches, and the right brow antler 20 inches, the weight of both horns being together 22½ lbs.

These horns have nine tines, being three more than the regulation number, and are spoken of in the *Asian* by one correspondent as the "Coromandel monstrosity." They were picked up on the Coromandel Coast, and though there is every reason to suppose they are sambhur horns, still they are described as a trophy representing the utmost limit of eccentricity which nature is capable of producing. The weight of these horns is enormous, but this can be partly accounted for by the horns being malformed and containing three extra tines. The editor of the *Asian* stated that a correspondent wrote he had seen horns of 44 inches, and quoted another from *Wilson's Himalayan Journal* of 46 inches. One or two correspondents, I see, record horns of 39 inches as being large. Mr. Sterndale, in his book states he has in his collection a horn of 45 inches, whilst Mr. Inverarity tells me he has killed one of 44 inches. I have killed one or two heads over 39 inches and one of 41 inches. From a perusal of a book called "Nilghiri Sporting Reminiscences," it would appear the Nilghiri sambhur have but small heads, as the author of that work speaks of the best heads as being only 35 or 37 inches. Captain Forsyth, in the "Highlands of Central Iudia," a great authority, speaks of 41 inches as the largest he had ever seen.

This is all the information I can give you about the size of sambhur horns, and it shows conclusively that this broken horn beats the record into fits by several inches. I should mention that this broken horn weighs 6 lbs. 3 oz., and assuming everything in its favour, it could hardly weigh so much as the Coromandel Coast horns, unless, perhaps, the extra tines were cut off the latter, and then, perhaps, the horn might equal the largest of them. I wrote a letter to the *Asian* some time ago describing this horn, in the hope that sportsmen and naturalists might supply some further information or discuss the subject, but with the exception of its publication by the editor, nobody took the slightest notice of it; I fear that I was taken for one of the 12 foot tiger school and thought unworthy of notice.

A FIGHT BETWEEN STAGS.

I have often come across places in the jungle where the bushes and grass have been trampled down and the ground torn up, showing the scene of a combat between two sambhur stags.

A few years since, whilst walking along the jungle overhanging the Taptee River, my attention was attracted by the noise of the clashing together of horns on the other side of the river, some 300

yards off, and getting out my binocular glasses, I watched a fight between two fine stags. I did not get a clear view of the fight because the bushes and high grass so often impeded the view; but I watched them for some time, and the fight continued for several minutes. I went round by a ford and got over to the other side of the river in the hope of getting a shot, but was unsuccessful. Sambhur are supposed to shed their horns annually in or about March as the hot weather comes on, but this is denied, I see, by the author of "Nilghiri Sporting Reminiscences," who states that the annual shedding of horns by sambhur is a myth in the Nilghiris, and he states that he has known, by undoubted evidence, stags carry their horns more than two successive seasons. Captain Forsyth, in the "Highlands of Central India," states he was perfectly convinced that neither in the case of the sambhur nor the cheetul are the antlers shed regularly every year in the forests of Central India. I have myself on a few occasions seen sambhur with good heads in May, and I have often seen cheetul with good heads in that month. I once shot a good stag sambhur in May. I think, therefore, we may be satisfied that sambhur do, as a rule, shed their horns annually, but there are often exceptions to the rule. In the hot weather in the Satpuras, when the jungles are burnt, I have noticed the sambhur often get together, five or six in a herd. I have seen as many as seven or eight. The jungle being very open there they are very wild and difficult of approach. Captain Forsyth speaks of seeing herds of thirty and forty in this neighbourhood. No such herds are to be seen now. They appear to like to keep up in the hills in the hot weather, and do not often come down in the plains below in the day time.

SAMBHUR NEAR BOMBAY.

There used to be sambhur in the island of Salsette. In 1877 I was in at the death of one on the top of the high hill over Vehar Lake, within 18 miles say of where we now are. I regret to say she was a hind, but for my own reputation I must say I had no hand in killing her. I believe she was the last survivor of the race in Salsette, as I have never heard of any there since. At Lanowlee, close to the reservoir, I once put up a doe sambhur with its fawn whilst beating the jungle. Alas! two valiant railway men from Lanowlee killed them both next day, and I believe there are none in that neighbourhood now. Sambhur occasionally bell when they

are disturbed by man, but they always bell when they see a tiger. On two occasions when beating for tiger, I have known a sambhur driven out past the guns without sounding any note of alarm, but when some distance behind commence to bell. On both these occasions the tiger was behind the guns and near where the sambhur commenced to bell, so that I infer he must have seen the tiger and then commenced to bell. It would, therefore, appear that the sambhur bells when he sees the tiger either to warn any of his mates who may be in the neighbourhood, or to express his hatred like the monkeys, who often follow the tiger from tree to tree and rock to rock swearing all the while, and that the belling is not necessarily caused by fear. A native shikaree first drew my attention to this theory, and I have talked with one or two sportsmen, whose experience was much the same as mine.

ANTIPATHY TO TIGER.

The well-behaved monkey never swears, except at a tiger or panther, but the sambhur, who is of a lower order, occasionally swears his swear at something else besides the tiger. There is no doubt the tiger is the sambhur's deadliest foe, and that he frequently affords food for the tiger. I have several times come across the remains of sambhur killed by tigers. After I had written the above, I happened to come across a passage in the "Nilghiri Sporting Reminiscence," in which the author, who appears to have had considerable experience of sambhur stalking, states that the sambhur never bells upon seeing a man but only at the sight of a tiger; but I know him to be wrong there, because I have on a few occasions had a sambhur bell at me when I have disturbed him. I have used the expression "bell" throughout because that is the word generally used, but I think "bark" would be a more expressive word.

SAMBHUR IN AUSTRALIA.

Sambhur and Cheetul have been brought to Australia from India and turned down. I am told that cheetul thrive wild, and have increased at a great pace in Gippsland, Victoria, but I saw none of them and can give no personal information about them. Last year, however, I made the acquaintance of the sambhur in Victoria, at a station called Ercil-down, belonging to Sir Samuel Wilson. I saw about seventy in a large deer park. In the middle of this park there was a hill and the ground was well suited for sambhur. They,

however, all seemed dwarfed, and none of the stags had heads of any size worth mentioning. The climate is rather cold in winter for them there, and this may account for it. It was in the month of August, the cold weather there, when I saw them, and at that time the stags had their horns. I saw none in velvet. In the month of August in India, sambhur would be in velvet, of course. As these sambhur increased, they were from time to time turned down wild in the neighbouring hills, and I was told they thrive in a wild state.

THE MEANS OF SELF-PROTECTION POSSESSED BY PLANTS.

(*Read at the Society's Meeting on 6th September* 1888.)

By Dr. W. Dymock.

The number of destructive insects which abound in India render it very necessary that plants should have some means of protecting the stores of starch which they elaborate for future use. Amongst the starch-storers there is no class in this country more abundant than the Aroideæ, especially at this season of the year. Some plants of the genus, such as the *Amorphophallus campanulatus*, or सुरण, produce enormous tubers under cultivation, weighing as much as eight or ten pounds or more, and composed almost entirely of starch. Different kinds of Colocasia, known in the vernacular as अळू, are always to be seen in the gardens, of even the poorest people, during the rainy season ; and their leaves, stems, and tubers are favourite articles of food amongst all classes of the population. The leaves especially made into a roll with gram flour, and spices, boiled, and then cut in slices and fried, form a very tasty vegetable dish called पातवडी or पातवड, *i.e.*, "leaf-cake." The *Colocasia antiquorum* is one of the oldest vegetables known, and derives its Latin name from the Coptic Kalkasi. Pliny notices it as a favourite vegetable in Egypt. Most of the varieties of Colocasia and other edible Aroids are so acrid that it is only by prolonged boiling and the addition of some vegetable condiments containing citrates that they can be made palatable; they all die away in the dry weather after producing one or more tubers. It must be

evident to every one that a large starchy tuber would stand a very poor chance of escaping destruction during the many months it has to remain just beneath the surface of the ground awaiting the next rainy season, were it not that nature affords a sufficient protection by storing in the root-cells a number of needle-shaped crystals which cause the most intense irritation when ingested by any animal, and have often proved fatal to man. The effects produced by the raw or imperfectly cooked plant are swelling of the tongue and throat, convulsions, asphyxia, and other signs of poisoning by an irritant.

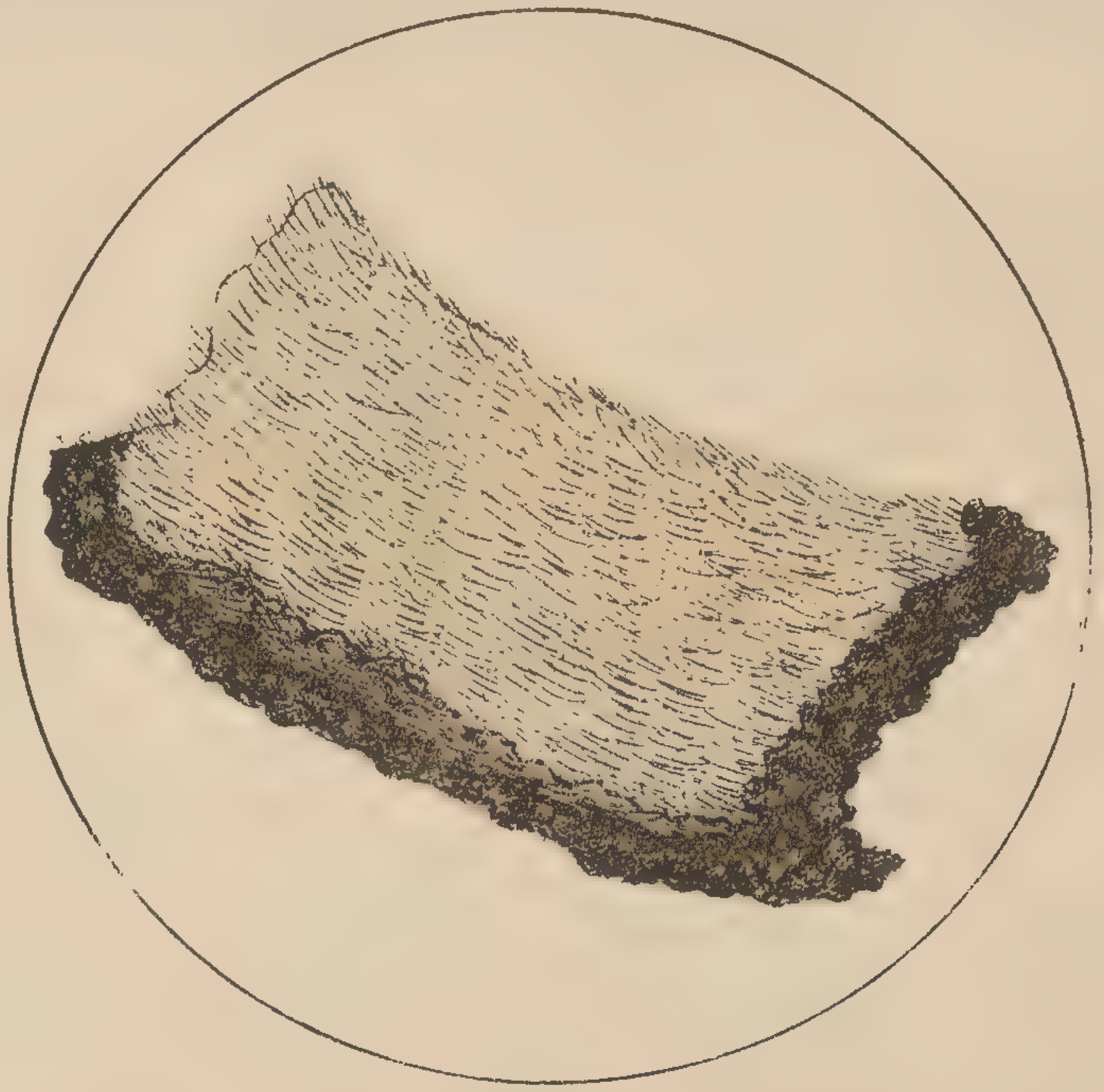
Pedler and Warden in 1886 were the first to point out that the toxic effects of Kachoo (the Bengal name for Colocasia) were due to entirely mechanical causes, and that the tubers contained no specific organic poisonous principle as had hitherto been supposed. The same theory has since, apparently, been independently adopted by Herr Stahl, who, at a recent meeting of the Jena Naturalists Society, read a paper upon the significance of those excreta of plants which are known as raphides. From experiments this investigator inferred that they were a protection to plants against being eaten by animals. Many animals avoid plants with raphides, or eat them reluctantly, and snails in eating these plants select those parts which are without the crystals. (*Nature*, Dec. 29th, 1887.) Messrs. Pedler and Warden's experiments showed that these needle-shaped crystals are composed of calcic oxalate, a salt very insoluble in water even after moderate boiling, which accounts for the acridity of the tubers when cooked in the ordinary manner; they also demonstrated that the addition of nitric and hydrochloric acids, which dissolve the salt, immediately removes the acridity of the tubers. Two difficulties still remained—1st, it is well known that the dried tuber is practically harmless, but microscopic examination explained this by showing that the crystals, which in the fresh root are arranged in loose fan-like bundles, are in the dried root brought parallel to one another and become adherent, forming practically a single blunt crystal; 2nd, how is it that the hydrochloric acid of the gastric juice does not dissolve the crystals and thus prevent irritation of the intestines? The answer is that excessive irritation of the stomach produces a stoppage of the flow of gastric juice, and the pouring out of a ropy mucus instead. (See Pedler and Warden's paper, Journ. Asiat. Soc. of Bengal, Vol. LVII., Part II., N., 1, 1888.) When cooking these plants the natives of India

use mango or limes to remove the acidity. They have found by experience that kokum and tamarinds will not answer for this purpose. I find by experiment that calcic oxalate is soluble in a solution of citrates but not in a solution of tartrates and malates, to which the acidity of tamarinds and kokum is due. Schima Wallichii, a tree of Nepal belonging to the Ternstræmiaceæ, affords us an excellent example of a very starchy bark protected from the attacks of animals by a peculiar development of the liber, which resembles sharp glistening white needles, and causes much irritation when handled. The Nepalese call the tree *chilauni*, or itch tree, and *makkarchal*, or spider's itch tree. The liber cells are about $\frac{1}{12}$ of an inch long, translucent, and sharp-pointed at both ends; the bulk of the parenchyma consists of cells containing starch and a red colouring matter; by macerating the bark with water, the liber cells are easily separated and may then be examined under the miscroscope.

The bulbous roots of squills and many of the Liliaceæ are protected by the presence of irritating raphides, the effects of which are well-known to those who have to slice these bulbs preparatory to drying them for medicinal use. The raphides, like those of the aroids, consist of calcic oxalate deposited in cells containing mucilage and forming bundles of needle-shaped crystals or large solitary square prisms. Oxalate of calcium is generally associated with mucilage in most plants, and this fact is remarkably evident in the squill and other lily bulbs. If these bulbs are finely sliced and shaken in a bottle with water, a quantity of the crystals will be deposited, and are clearly visible to the naked eye, but it must not be supposed that every plant which contains calcic oxalate has acrid properties. This depends entirely upon the shape of the crystals, of which thirty-four forms at least have been observed in European plants.

In a recent number of the Dutch journal, *Maandblad voor Natuurwetenschapen*, J. H. Wekker, in an article upon "De vorming der kristallen von oxalzure kalk in de plantencel," shows, that even in the youngest cells the crystals are always found in the vacuole, and if the microscope be inclined, they will show by gravitation that they are free and not embedded in the protoplasm.

Wekker found this to be the case in twenty-nine different plants examined by him, only occasionally a crystal adheres to the protoplasm bordering the vacuole and is set in motion by it. These observations explain the rapidity with which the irritating effects of



BARK of the ITCH TREE (SCHIMA WALLICHII) showing the Liber Cells—(slightly magnified.)

LIBER CELL of the bark of SCHIMA WALLICHII—(magnified 30 times.)

the crystals are produced when the plant is wounded by the teeth of any animal.

Crinum ornatum, Wight, the pretty white lily so common in the Concan, and known to the natives as गदांभीकांदा, has such acrid bulbs that they are used to blister cattle.

Several species of Vitis protect their tubers by the same mechanical means, *V. indica* for example, *Vitis carnosa* protects its fleshy stems, and *V. lanceolaria* its fruit, whence it has received the Marathi name of खाजगोलाची वेल, or itch-berry-vine.

Gnetum scandens, उंबळी, produces a plum-like fruit in the pulp of which are many stinging hairs of a reddish yellow colour.

Hibiscus cannabinus and *Sterculia urens* have formidable seed pods beset with stinging hairs. The different species of Mucuna protect their pods in the same manner. I need hardly mention the many thorny plants found in this country, as their means of protection is so obvious. The nettles form a separate class, their irritating action being partly mechanical and partly chemical. The stinging hairs with which these plants are armed are hollow; at the base of each hair is situated a gland containing an acid (formic). When the hair enters the skin and is broken off, the pressure causes the discharge of the acid, by which a swelling is produced like that caused by the sting of many insects. The nettle tribe is well represented in India by the Pouzolzias, Gerardinas, Bœhmerias, and Urticas. A species of Pouzolzia is known to Europeans as the Nilgiri nettle, and *Urtica interrupta*, खाजोती, is a common weed in neglected corners of the Bombay gardens at this time of year, and is not unlike the common English nettle. It may be thought that nettles have little worth protecting, but the genera Bœhmeria and Pouzolzia yield some of the strongest and finest fibres in Asia.

Many plants are protected by their poisonous secretions, notably those of the Euphorbiaceæ. Well-known examples are afforded by the genera Excæcaria, Euphorbia, Ricinus and Croton, all containing poisonous principles which protect their foliage and fruit from injury.

The *Excæcaria Agallocha* so common about Bombay derives its Latin name from excæcare, to blind, and is called by the Marathas फुगलि, on account of the great swelling and pain caused by contact with its acrid milky juice. It is difficult to induce labourers to cut or interfere with the tree, so much do they dread it, and animals equally avoid it. This plant, although it bears the name of Agal-

locha, does not produce Aloewood, but the herbalists obtain the dry inert suber from old trees, and sell it as a strengthening medicine under the name of Tejbal. The poisonous principle contained in the juice has not been properly examined, but it is probably an acrid resin like that from gum euphorbium, which is well known as a blistering agent.

The genus Euphorbia is a very large one, and most of the plants are remarkable for a milky poisonous juice which makes them obnoxious to animals. Thus in Guzerat we see the hedges made of the *Euphorbia Tirucalli* or milk bush, which though a fragile, smooth plant, so abounds in milky poisonous juice, that cattle will not break through it. *Euphorbia neriifolia,* another hedge plant, yields a similar juice, and it is also protected by thorns; others of the genus have the same properties. The poisonous principle of such of the Euphorbias as have been examined chemically appears to be identical, and the same as that of the drug Euphorbium. They also agree in yielding to analysis, a crystalline substance, called Euphorbon. The Ricinus, or castor-oil plant, which is such a common weed here, protects its oily seeds from destruction by a powerful toxic principle quite distinct from the purgative oil with which we are all so well acquainted. These seeds have in Europe often proved fatal to children, even when very few have been eaten. Dr. Stillmark has recently discovered in them an albumenoid body which he has named *ricin,* and which produces the most violent inflammation of the gastro-intestinal tract in men and animals. A dose of six milligrams of *ricin,* which would be contained in about ten seeds, would be sufficient to kill an adult man. The results obtained by the experiments of Dr. Stillmark are confirmed by experience, for we find that when children eat the seeds which are scattered on the wharf during the discharge of cargo in Europe, they suffer from severe vomiting and prostration, but not from catharsis. Croton seeds owe their immunity from the attacks of insects to the presence of crotonoleic acid, the most violent cathartic known.

Nerium odorum, the sweet-scented oleander belonging to the Apocyneæ, is a most poisonous plant, and is never eaten by animals. Its Sanskrit name Asvamaraka, or horse-killer, shows that its properties have long been known in India; and De Gubernatis informs us in his Mythologie des Plantes, II., 257, that the closely allied plant Nerium Oleander of Europe is called in Italy ammazza

cavallo, or ammazza l'asino, and remarks that this accounts for the dread of its presence shown by the ass of Lucian and Apuleius. Both plants are poisonous. Our Indian oleander contains two active principles, *neriodorein* and *neriodorin*, both powerful heart poisons; these exist in all parts of the plant, as has been frequently demonstrated by the poisoning of children who have eaten the leaves or flowers.

The oily kernels of the marking nut and cashew nut are protected by their pericarps, full of an acrid blistering fluid containing anacardic acid.

We all know how nauseously bitter most of the wild Cucurbitaceæ are in this country. Were it not so, their soft pulpy fruit would be exterminated by the snails and slugs, which abound at the time of year when most of them ripen. When, under cultivation, cucumbers and melons have lost their bitter, purgative, and emetic principles, they require the constant watchfulness of the gardener for their protection.

Bitterness or astringency in the bark of many trees doubtless saves them, to a great extent, from being injured by cattle.

Some bulbs, such as onion and garlic, as well as some cruciferous plants, are obnoxious to animals, on account of the pungent oils which they develop. No animal appears to relish mustard, but almost all the Cruciferæ, as well as onions, garlic, &c., are eagerly sought after by man. The leaves of *Anona squamosa*, the custard apple, are not browsed upon by cattle, and when crushed they have an acrid and disagreeable odour, so much so that the country people use them instead of smelling salts as a remedy for the vapours. The leaves, young fruit, and seeds are powerfully insecticide, and are in common use for washing the head when the population become too lively.

Rue is protected by its nauseous volatile oil; terebinthinate exudations and gum-resins make many trees and umbelliferous plants obnoxious to cattle. The mints, the balms, and basils, though their odour is pleasant to man, are not generally depastured by animals; even in Arabia, where pasture is scarce, the common wild basil or Calamintha (faranjmishk) is left untouched.

Camphor appears to be particularly disagreeable to animals, and a numerous class of plants in India owe the safety of their starchy depôts to this substance, or in some instances, to an acrid resin. I allude to the Scitamineæ. In this class most of the Curcumas have

camphoraceous tubers; those which do not smell of camphor are more or less acrid, such as *Curcuma caulina*, the Mahableshwar arrowroot; ginger contains an acrid resin and a volatile oil. When dried, these tubers are freely eaten by weevils and mites, which appear then to be able to separate the starch cells from those containing resin and odorous principles.

Bony coverings or shells protect many seeds. The sea cocoanut and bonduc nut are carried about by the ocean for months without losing their germinating power. Bonduc nuts have even been found on the coasts of Scotland.

Lastly, the seeds of the smaller weeds, which germinate so abundantly on the first fall of rain, owe, to a great extent, their preservation from destructive insects, during the hot season, to their forms; which often so nearly resemble grains of sand or earth that, when mixed with the soil, they are most difficult to distinguish.

Of this fact we may satisfy ourselves if we carefully powder and lift a little dry mould or sandy soil from a road, and then, having with the aid of a lens removed everything which has the appearance of a seed, place it under a glass bell and keep it moist with distilled water. However carefully the experiment may be conducted, we shall find that in a short time some of the familiar road-side weeds will make their appearance.

THE NATURAL HISTORY OF A VOYAGE FROM LIVERPOOL TO BOMBAY.

By E. H. Aitken.

(*Read at the Society's Meeting on 1st October* 1888.)

The Naturalist on board a steamer suffers the pains of Tantalus, who was doomed to pass eternity, hungry and thirsty, with food and water always in sight, but just beyond his reach. On a steamer one rarely passes a day without seeing something of interest, but rarely secures a specimen. He could easily shoot valuable birds, which he will never see again, but I have never met with a captain enlightened enough to stop his steamer in the interests of science and pick up the treasure. However, the organ of a true naturalist's faculty is his eye, and perhaps, after all, the discipline is

wholesome which forces him for a time to stay his hand from slaying and content himself with watching. I spent much of my boyhood prowling about stealthily, with a catapult in my hand, plotting against the lives of little birds. The little birds were rarely any the worse, and I learned more of their habits, voices, and distinguishing characteristics than I have ever done since. Now I go out with a gun, and if I meet with an unfamiliar bird, I have scarcely a chance of becoming acquainted with it before it ceases to be a bird and becomes a specimen. I have the specimen, but that is poor compensation. Every day I live I become more confirmed in the conviction that no naturalist can adopt a wholesomer motto than the saying of a very wise man, of whom it is recorded that "he spake also of beasts and of fowls, and of creeping things, and of fishes." The saying I refer to is this, "A living dog is better than a dead lion." I suppose every ship that leaves Liverpool is followed by a party of gulls, which accompany it all the way down the Channel, but leave it as soon as they see plainly that it is bound for other shores. These birds have become as dependent on man as the common Indian crow. Without our shipping and our great seaports, I imagine half the gulls on the English coast would die of starvation. As it is, the hard times of which we hear so much, seem to press severely on them. On a summer day last year, not far from Glasgow, I was surprised to see a large number of gulls at a great height in the air, crossing and re-crossing, and performing the most energetic evolutions in which I had ever seen gulls engaged. After watching them for a while, I discovered that they were engaged in hawking insects in the air, just as we see kites and crows in India preying upon a swarm of winged white ants. At Edinburgh I saw a number of terns engaged in the same way above Arthur's Seat. The party of gulls which followed our ship was composed exclusively of one species, the common grey and white herring gull, and the easy grace of their flight supplied matter for never-ending wonder and admiration. With the wind, or in a calm, they flap their wings and fly like other birds; but against a strong head wind they will keep up with the ship, overtake it, fall back, rise and sink, simply by holding their wings at a certain angle to the wind, on the same principle on which a good sailing boat can go almost in the teeth of the wind. In striking contrast to the gulls are the puffins with their short wings and clumsy beaks, more like parrots at sea than orthodox water birds. These

do not live in the air like the gulls, but on the water, floating very happily on the waves and constantly diving in pursuit of fish. These birds also leave us as soon as we are fairly out of the Irish Channel. Then the stormy petrels appear and scarcely leave us till we reach Port Said. All day they are on the wing in the wake of the steamer, skimming the water with all the power and grace of swallows. In fact, at a very short distance they are so absurdly like the common black and white swift, which makes its feather nests under the porches of our public buildings here in India, that the first time I saw them I exchanged views with a fellow-passenger, who was also a naturalist, upon the remarkable phenomenon of a swift taking to a marine life. Where these petrels go at night I cannot say. During the day they are very rarely seen to rest on the water. Mr. Wilson records an instance of one which was shot at from a ship, with the result that two of its quill feathers were broken, and their ends hanging down, made it easily recognisable afterwards. For a whole week that bird continued to follow the ship. If it had stopped to sleep for even an hour it could scarcely by any chance have found the ship again, and as they never rest on the rigging or any part of the ship, it seems that this bird must have been on the wing night and day for a week with no intermission, except, perhaps, an occasional rest on the water for a few moments. I have watched them with a powerful glass to see if I could ascertain what they fed on, but could not satisfy myself. Undoubtedly they do sometimes, like gulls, pick up scraps of food thrown overboard, but from the persistent way in which they beat up and down the line of seething water which flows from the stern of the steamer, I have got the impression that they are on the watch for small marine creatures killed or tossed to the surface by the action of the screw. I should like to know whether they follow sailing vessels in the same way. I must not forget to mention that I saw one petrel on this side of Aden, which, I suppose, was Wilson's petrel (*Oceanites oceanica*). After passing Cape Finisterre, whales are often seen spouting, but they rarely come near enough to a steamer to be distinctly seen. A few years ago, however, one of the B. I. S. N. Company's steamers, coming from Kurrachee to Bombay, was accompanied for a whole day by a whale, which came so near, I believe, as almost to rub against it. Some of the passengers or officers, following the true Englishman's instinct of killing, fired rifle balls into it. I do not remember whether the whale showed any signs of being aware of this. Curious

to say, the best view I ever had of a whale was between Kurrachee and this. Four or five were playing within a mile or so of the steamer, and one monster several times rose above the surface like a volcanic island, quite near enough to give me a distinct view of it. This was, I suppose, *Balaenoptera indica*, which is sometimes stranded on our coast. The skeleton of one which was so stranded near Bassein forms the 'piece of resistance' in the Victoria and Albert Museum. If whales avoid steamers, there is one marine mammal which has no such fear. This is the dolphin (*Delphinus delphis*), a near relation of the porpoise, which is common enough in our harbour, but easily distinguishable by its sharp snout, slender form and colour, which, in the water, appears to be silvery grey above and white beneath, though I believe that when the animal is out of the water its back is almost black. There is something very fascinating in the high spirits and jubilant happiness of this creature. It is just the animal to offer its back to Orpheus, though I would be scientifically sceptical about its being charmed by his music, on the ground that its ears being usually under water, his strains could hardly have reached them. The dolphin is very common in the Mediterranean, going in pairs or small companies. When they catch sight of a steamer, they race for it, leaping out of the water in concert when they want to breathe, as if they were steeple-chasing and clearing hurdles. When they reach the steamer they get in front of it, just under the bows, and sport in the foam which it drives before it, rolling over on their backs, leaping out of the water, diving, and performing marvels of agility, without betraying, by any motion which you can detect in fin or tail, that they are exerting themselves. All the time there is an expression of fun and happiness on their faces, if I may use the term, which is infectious and makes this one of the most delightful of the small excitements which enliven a sea voyage. Every dolphin in the Mediterranean seems to know the trick, and when we neared Port Said on my way out last month, three of the porpoises, which are so common in that harbour, came out to meet us and tried to disport themselves in the same way, but the clumsiness of their efforts was positively ludicrous to one who had seen dolphins doing the thing. All the way from Gibraltar to Port Said the ship is visited occasionally by land birds, butterflies, moths, and other insects. At two seasons in particular, about April and again about September, hundreds of migratory birds, crossing the sea, are glad to get a

rest. The sight of a quail in these circumstances is fitted to give one a vivid conception of this strange instinct of migration. Here is a bird which lives on the ground and for six months in the year never uses its wings except when "put up" by some enemy, and then only to fly a hundred yards and drop again; but when the sun enters the sign of Aries, it starts off without fear from Alexandria, say, to Italy or Greece. Hundreds are often killed in Malta, I believe, when they arrive too tired to make much effort to escape, and, without doubt, hundreds perish in the sea; but I suppose the majority reach their destination. They fly very low, almost touching the water, and rising to every wave. I suppose this is to escape the force of the wind. All through the Red Sea and also between Aden and India migratory birds are met with. On this voyage I noted the following:—Quails, a hoopoe, one or two yellow wagtails, a wheat-ear or bushchat, a light brown robin with a rufous tail, a species of bunting, and several tree warblers. One of the last spent several days on the ship and was very hungry, hunting for insects in the joints and crevices of iron plates, poor bird! When within one day's sail or so of Aden, ships are often visited by peregrine falcons. I imagine they go far out to sea in pursuit of sea birds. When they settle on the ship they are often so exhausted that the sailors climb up the rigging and catch them. At the southern end of the Red Sea gulls and other sea birds are on all sides, but disappear as soon as we pass Aden. After that we fall in with two very interesting birds, which have been given a place among our Indian avifauna, the Tropic bird (*Phæton indicus*) and the Noddy (*Anous stolidus*). The former, a smoky coloured bird, as restless as the petrel, skims the surface of the water in all directions, but never follows the ship; the latter flies at a great height with a seemingly laborious flapping of its short wings, and drops into the water like a kingfisher. If its snowy plumage and long tail do not attract attention, its incessant screams will. Of fish in any form, except salt or tinned, one sees very little indeed during a voyage on a steamer, but on this occasion when we drew near Perim the *khalasees* threw out a large hook with a bit of white rag wrapped round it. This trailing from the stern of the vessel, looked very like a small fish rushing through the water, and succeeded in "taking-in" a large dolphin, not the mammal which I have mentioned already, but a species of fish which all sailors persist in calling the dolphin. Its proper name is the coryphene (*Coryphæna hippurus*). I had so often found myself at variance with ancient mariners as to what was a

dolphin that I was very glad to have an opportunity of seeing this fish, which is certainly one of the most splendid of living creatures. When in the water it shines with dazzling brilliance, like burnished brass in a green light; but as soon it is taken out, it changes to various shades of dark green, blue, and purple, sprinkled all over with round spots of the most intense blue, and bordered or touched at various points with green and gold. As life ebbs, the colours become rapidly duller, but even in death it is a most beautiful fish. This is the fish to which Byron refers in describing a sunset in the Mediterranean—

"parting day
Dies like the dolphin, which each pang imbues
With a fresh colour as it gasps away,
The last still loveliest, till—'tis gone, and all is grey."

The *khalasees* considered the coryphene a great prize; but the captain and officers did not grudge it to them. I suppose it is coarse. The chief business of the coryphene is to pursue and eat the flying fish, and the chief use of the wings of the flying fish is to help it to postpone death by the coryphene. Flying fish are found in many seas; but between this and Aden they are so thick as to leave little room for water. All day they rise on both sides of the steamer like locusts, their silver sides glittering in the sun. At this season (in September) they are mostly about four inches long. In April or May they seemed to me much larger and not nearly so abundant. At night they fall upon the deck in numbers and are eagerly picked up by the *khalasees* to be converted into curry. As they fall, a splash of phosphorescence marks the spot. Many species of fish are phosphorescent; but without a microscope it was impossible to settle whether the luminosity in this case was not due simply to minute organisms in the water which fell from the fish. The waters of the Arabian Sea at this season become brightly luminous when agitated, owing to the presence of minute species of phosphorescent protozoa; but on the other hand I twice noticed the whole sea become luminous for half an hour, so faintly that it just looked like Bombay milk, and this the captain attributed to a passing shoal of small fishes, probably flying fishes. Even if he was right, the effect might not be due to luminosity in the fishes themselves, but to the gentle agitation of the water as they passed through it. Before I leave this subject, I will remark that it does not appear to be generally known that the great Sea Serpent is phosphorescent. Nor did I know it till one dark evening just a

month ago. I was sitting on the deck engaged in my usual evening occupation of wishing it was bed time, when I saw, rushing through the water at a fearful rate with a wavy motion, something all ablaze, at least 60 feet in length. I sprang to my feet with a shout and ran to the side of the ship. The monster doubled upon itself and rushed close by the ship almost under me, and I saw plainly, just beneath the surface of the water, a huge porpoise leaving a trail of light behind it! But it is time to stop. The last specimen I saw at sea was a native of Bombay, a large butterfly of the genus *Catopsilia* going out to sea. This is the way in which this and some other butterflies meet the difficulty of over-population. Soon after that specimen passed, we were at anchor and the cheering voice of the Bombay crow assured me that I was in this beautiful city once more.

Dr. D. MacDonald proposed a vote of thanks to Mr. Aitken for his paper, which was much appreciated by all present.

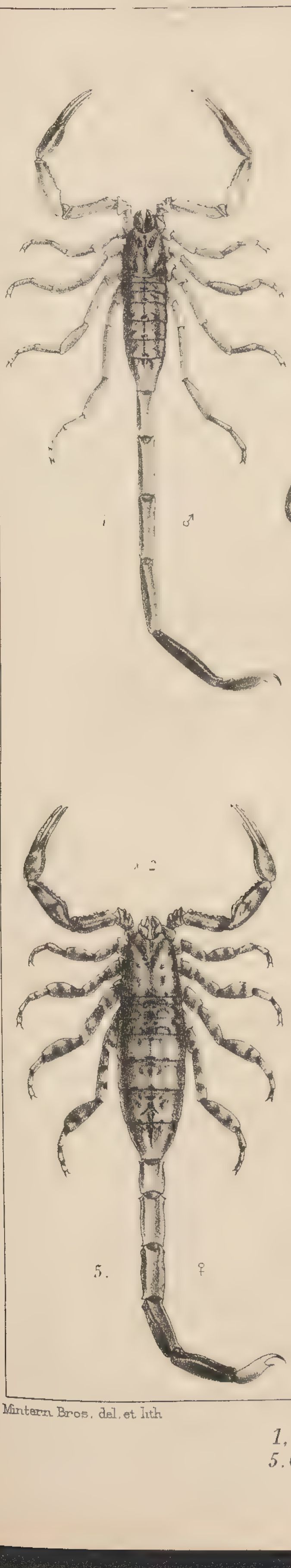
The Honorary Secretary stated that Mr. E. W. Oates, the well-known author of the *Birds of Burmah*, had given the Society, for publication in its journal, a valuable paper on *The Indian and Burmese Scorpions of the genus Isometrus*, in which he had described three new species. Mr. Phipson added that Mr. Oates, who was now in England publishing the *Birds of India*, had given the Society great assistance in various ways, in recognition of which he (Mr. Phipson) proposed that Mr. Oates should be elected an honorary member of the Society. This proposal, on being put to the meeting by the Chairman, was carried unanimously.

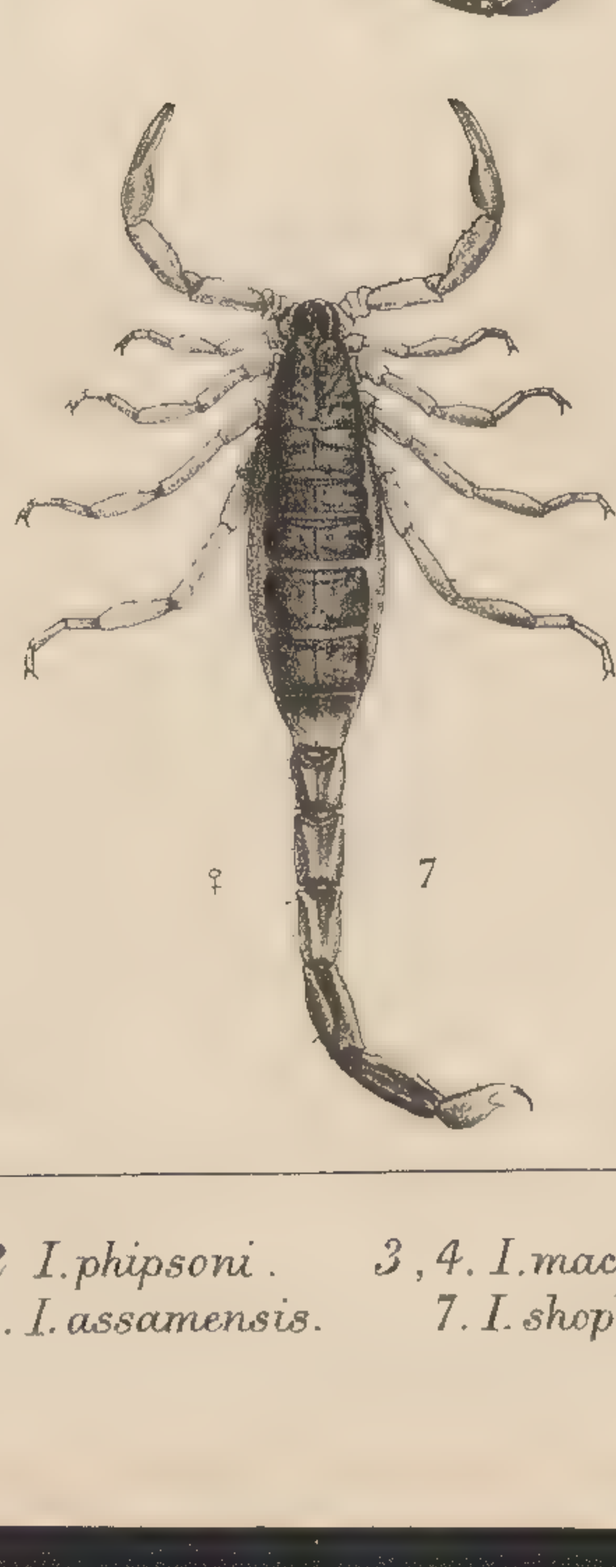
ON THE INDIAN AND BURMESE SCORPIONS OF THE GENUS *ISOMETRUS*, WITH DESCRIPTIONS OF THREE NEW SPECIES.

By Eugene W. Oates, F. Z. S.

(*Read at the Bombay Natural History Society's Meeting on 1st October* 1888.)

The small and elegant scorpions of this genus are well represented throughout Burma becoming less frequent in India. The largest





5. ♀

♀ 7

♂ 6

Mintern Bros. del. et lith

London.

1, 2 I. phipsoni. *3, 4. I. maculatus.*
5. 6. I. assamensis. *7. I. shoplandi.*

known species does not much exceed three inches in length, and the smallest is less than two inches. The colours of all are yellow or fulvous marked with black, the former colour preponderating on the limbs and the latter on the head and body.

The genus *Isometrus* is characterized by the following structural peculiarities. The sternum is triangular; the movable finger of the mandibles is furnished with teeth on both edges; the fixed finger has teeth on the upper margin, but only one small tooth or spine on the lower edge; the serrated edges of the fingers of the chelæ are composed of short simple rows of small teeth obliquely parallel to each other, and each row furnished with a larger tooth, one on each side, at the basal end of the row; the sixth joint of the tail is furnished with a spine under the sting.

Of the eight species found in India, Burma and Ceylon, I have been unable to examine specimens of *I. tricarinatus*, E. Simon, and *I. basilicus*, Karsch, the former described from Pondicherry and the latter from Ceylon. It is hoped that some of the members of the Society, favourably situated for the purpose, will endeavour to procure specimens of these two species for the museum.

I subjoin a key by means of which the eight species found within the limits of British India may be identified without much trouble:

A.—Second joint of tail furnished with ten keels.

a. The last abdominal segment below, with four keels.

a'. Mandibles, cephalo-thorax and body above blackish; cheliceres and legs fulvous without marks. .....*shoplandi.*

b'. The whole animal uniform fulvous. .....*tricarinatus.*

b. The last abdominal segment below, with only two keels.

c'. The upper part of the first four joints of the tail, extending on each side to the second keel, immaculate fulvous. .....*atomarius.*

d'. The upper part of the first four joints of the tail mottled with brown .....*varius.*

B.—Second joint of tail furnished with only eight keels.

c. The tibial joint of the 4th pair of legs furnished with a strong spine at its apex.

e'. The fingers of the chelæ not longer than the hand. .....*basilicus.*

f'. The fingers of the chelæ much longer than the hand. ....*phipsoni.*

d. The tibial joint of the 4th pair of legs not provided with a spine at its apex.

g'. Anti-ocular region black with a distinct triangular yellow patch, the apex reaching to the eyes; tail distinctly spotted.*maculatus.*

h'. Anti-ocular region entirely black; tail infuscated throughout. .....*assamensis.*

The characters of *I. basilicus* and *I. tricarinatus*, of which, as before remarked, I have not been able to examine specimens, are derived from M. Simon's remarks in the "Annali del Museo Civico di Storia Naturale di Genova, vol. xx., pp. 325-372 (1884).

1. *Isometrus shoplandi,* N. Sp., fig. 7.

♀ Cephalo-thorax, body above and the mandibles deep brown tinged with fulvous; the last abdominal segment wholly fulvous on its posterior half; cheliceres, under side of cephalo-thorax with pectoral combs and the legs uniform fulvous; the femoral and genual joints of all the legs with a reddish brown spot on the outside at the apex; lower abdominal segments yellow; the under side of tail with the four keels on the first four joints and the three keels on the fifth joint with the interspaces black, except at the anterior portions of the joints, which are fulvous; remainder of the tail wholly fulvous; sting black at the tip.

Length of cephalo-thorax and abdomen		1·	inch.
,,	tail	1·25	,,
,,	cheliceres	·7	,,
,,	hand alone.	·25	,,

The cephalo-thorax is coarsely and densely granulated, distinctly emarginated in front and divided longitudinally by a deep furrow passing between the central eyes, which are about a diameter apart and seated obliquely; abdomen above coarsely granulated with the median keel well developed on 2-6 segments; 1st segment without a keel; 7th segment with an obsolete central keel and four lateral ones;

extending from the middle of the segment to the posterior edge; the first four lower abdominal segments very smooth; the fifth finely granulated, with the two central keels well marked, extending from the centre of the segment to the posterior edge; lateral keels short and interrupted; first and second joints of tail with ten very distinct keels; third with ten keels, the third on each side less defined than the others; fourth joint with eight keels; fifth with three sharp keels below, the upper part rounded, with a longitudinal central depression; sixth joint with a keel below, terminating in a rather short blunt spine, and with some ill-defined keels at the sides; sting well-curved and very sharp, about as long as the joint it is attached to; legs normal, slightly keeled; the spine of the tibial joint sharp and about a quarter the length of the metatarsus; pectoral combs long, with 22 teeth; humeral joint of cheliceres nearly smooth; cubital joint with two parallel keels above, another one below and outside, and another beneath the joint; radial joint much swollen interiorly, smooth and rounded outside, the upper side with a nearly smooth keel, the inside with some blunt spines more or less arranged in two or three rows; digital joint small and perfectly smooth, the fingers half as long again as the hand, curved inwards and rather hairy.

The male is not known: most probably it will be found to differ from the female in structure only, not in coloration; the body will be smaller and the tail proportionally longer, and the fixed finger of the cheliceres will be found to be strongly sinuated as in *I. varius*.

I. shoplandi has hitherto been found only at Palone, a village about 50 miles north of Rangoon, and at Entagaw near Pegu. I have much pleasure in naming this well-marked species after Captain E. R. Shopland, the late commander of Her Majesty's Indian Marine steamer "Enterprise," a keen naturalist, who has always assisted me greatly, especially in the numerous trips we have taken together to the Burmese lighthouses.

2. *I. tricarinatus*, E. Simon.

A remarkable species, uniformly fulvous throughout. The length of the female is given as 1·4 inches or 38 millimetres. Pondicherry.

3. *I. atomarius*, E. Simon.

Described from Minhla on the Irrawaddy river in Upper Burmah, a few miles north of the old frontier. I have procured it at Thayetmyo and also in the Tharrawaddy District north of Rangoon.

♂ Length of body, ·58 in.; of tail, ·98; of cheliceres, ·72

♀ „ „ ·74 „; „ 1·02; „ ·72

This species is allied to the next, *I. varius*, from which however it varies in some important particulars. In *I. atomarius* the fifth lower abdominal segment is entirely fulvous yellow, with only one black spot near the anterior edge; the upper part of the first four caudal segments, as far as the second keel on each side, is clear fulvous yellow without any marks whatever; the cubital joint of the cheliceres has merely a small dot of black at each end on the upper side, and the radial joint is marked with black only on the terminal third of its length. It is also a much smaller species than *I. varius*. The male differs from the female in having the body shorter, the tail proportionally longer, and in having the fixed finger of the hand strongly sinuated on the basal half of its length.

4. *I. varius*, C. Koch.

An extremely common species widely distributed. I have taken specimens in all parts of Burma, from Tenasserium up to Mandalay. It varies greatly in colour from bright rufous to dull brown, but I cannot find that these variations are correlated with climate, specimens from the dry region of Mandalay being fully as brightly coloured as others from Tenasserim.

♂ Length of body, ·8 in.; of tail, 1·3; of cheliceres, ·95
♀ „ „ ·95 „; „ 1·25; „ ·85

The male is smaller than the female, with much longer (proportionally) tail and cheliceres, and the hand is much larger with a strongly sinuated fixed finger. The coloration of the sexes is the same.

5. *I. basilicus*, Karsch.

Appears to be rare in collections, but probably common enough in Ceylon. If correctly described, this species has the curious peculiarity of having the hands of the same length or longer than the fingers, a point of structure not possessed by any other known species.

6. *I. phipsoni*, N. Sp., figs. 1, 2.

This species, the largest of the genus, appears to be common in Tenasserim, whence I have received numerous specimens.

Judging from the description, this species is allied to *I. messor*, E. Simon, from Java, but it is much larger, and differs moreover in the coloration of the legs and other points.

♀ General colour fulvous yellow above; the cephalo-thorax nearly black round the central eyes and in front of them up to the anterior margins, the whole thickly and coarsely granulated, with the excep-

tion of a few patches and streaks which are quite smooth ; the first six upper abdominal segments thickly granulated with prominent central keels, each segment with two clearly impressed yellow spots on the hinder margin and a sub-marginal broad stripe on each side ; seventh segment with black granulations on the anterior central part, and with yellow ones elsewhere, lateral keels very distinct, mesial keel indistinct posteriorly. Legs above marbled with brown which nearly covers the fulvous yellow ground-colour, except on the terminal portions of the tibial and metatarsal joints and the whole of the tarsal which are fulvous without marks; the cephalo-thorax beneath is fulvous yellow, the pectoral combs yellow, and the first four abdominal segments shining yellow, with the posterior edges paler and duller yellow ; fifth abdominal segment dull fulvous yellow, finely granulated; under side of legs dull fulvous yellow ; first four joints of the tail fulvous above, infuscated below; fifth joint entirely dark brown or blackish ; sixth joint black suffused with reddish ; sting reddish yellow at base and deep red at the tip ; axillary, humeral, cubital and basal portion of the radial joints of the cheliceres fulvous, with one or two very minute brown marks in some, absent in other specimens; terminal portion of radial joint, the whole hand and the basal half of the fingers rufous brown ; terminal half of fingers fulvous yellow ; sides of the abdomen blue ; the hand is hardly as wide as the radial joint ; the two upper keels of the fifth caudal segment are sharp and strongly toothed, and there are five distinct keels on the under side of the sixth joint of the tail.

The ♂ resembles the ♀ in coloration, except that the first four abdominal segments below are deep fulvous, broadly edged posteriorly and laterally with yellow, and the fifth segment is of the same fulvous colour as the other ones and obsoletely granulated. In structure it differs remarkably, having a shorter body and a longer tail ; the cheliceres are much longer, and the hand is broader than the radial joint ; the keels on the upper surface of the fifth caudal segment are rounded and obsoletely granulated ; it has only one keel on the lower side of the sixth joint, and the granulations on this are absent.

In the female the length of the body is rather more than that of the first four caudal segments, whereas in the male it equals that of the first three segments.

♂	Length of body,	·95 in. ;	of tail	2·2 ;	of cheliceres,	1·55
♀	„	„	1·03 „ ;	„	1·45 ;	„	1·35

I name this fine species after Mr. Herbert M. Phipson, the energetic secretary of the Society.

7. *I. maculatus*, De Geer, figs. 3, 4.

I have this species from Tavoy, Moulmein, Rangoon, Table Island (Andamans) and Bombay. It is of very wide distribution. This scorpion and the next are peculiar in not having a spine at the end of the tibial joint of the fourth pair of legs.

The male differs from the female in having a smaller body and much longer tail and cheliceres. The colour is the same in both and so is the structure.

♂ Length of body, ·75 in.; of tail, 1·75; of cheliceres, 1·4
♀ „ „ ·8 „; „ 1·05; „ ·8

8. *I. assamensis*, N. Sp., figs. 5, 6.

From Dhubri in Assam, whence I received six specimens from my friend, Mr. O. G. Smart, of the Public Works Department. It is of much the same colour as *I. maculatus*, but is very much smaller. It may be distinguished at once by having the whole space in front of the central eyes black, the keels on the last abdominal segment obsolete; and the tail not spotted but clouded with fuscous.

Like *I. maculatus* it wants the spine on the tibial joint of the fourth pair of legs.

The sexes are alike in colour and differ in structure by the male having a smaller body and a longer tail; the cheliceres in both sexes are of much the same size.

♂ Length of body, ·5 in.; of tail, 1·0; of cheliceres, ·55
♀ „ „ ·6 „; „ ·85; „ ·5

The slight difference in size in the sexes of this species separate it widely from *I. maculatus*, in which the difference is very striking.

NOTE ON SOME BRANCHING PALMS.

COMMUNICATED BY MRS. W. E. HART.

(*Read at the Society's Meeting on* 11*th December*, 1888.)

To the popular mind, perhaps the most characteristic feature of the Palm family is the tall, straight, undivided stem, surmounted by its single head of leaves.

Some species, no doubt, as the edible date (*Phœnix dactylifera*), throw out a number of young plants from the parent stem at a

A BRANCHING DATE PALM (*Phœnix Sylvestris*)
IN THE RESIDENCY GROUNDS, INDORE.
(*From a Photograph received from Mr. L. S. Newmarch.*)
Drawn by Miss STARLING.

short distance from the ground. These can be removed without interfering with the growth of the main stem. Indeed I am told by Mr. Birdwood and other friends, who have seen this species in cultivation in Sind and other places, that the usual mode of propagation is by removing these young shoots, which, when planted, take root and enter upon an independent existence, and in time themselves throw out similar shoots.

A good specimen in Bombay is to be seen in the Elphinstone Circle Garden, close to the railings, a few feet to the left as you enter by the Western Gate. At a height of about three or four feet from the ground, from among the thick mass of adventitious rootlets which thicken the stem at its base, have sprung eight of these young shoots, radiating from the axis of the parent stem, to which four of them are still attached. The other four have been removed and planted in the Victoria Gardens, but only one seems likely to survive. Mr. Carstensen kindly showed it to me the other day in a large pot near the fern-house. When once it has properly rooted, it will probably be found to thrive quicker if planted in the open ground, for I have found that to pot young specimens of the common wild species (*Phœnix sylvestris*) greatly retards their growth.

But these young plants thrown out by the parent tree are not *branches* in the proper sense of the word. There are, however, certain species of so called "branching palms," in which the stems naturally bifurcate after growing single for some distance. Sometimes each bifurcation again divides after it has attained a certain height. Occasionally the operation is even again repeated in each of these second bifurcations.

Such is the Doum palm of Egypt (*Hyphœne Thebaica*), a good specimen of which is to be seen in the Sewree cemetery, a short distance from the gate on the left of the main walk as you enter. There, among a group of these palms with dichotomous stems, which I suppose found their way to the spot in the days when the Agri-Horticultural Society of Bombay had their head-quarters in the neighbourhood, is one which repeats the bifurcations in the manner I have described.

But besides the species in which the stems *naturally* divide, there are exceptional instances of apparent *monstrosities*, in which individuals of a species ordinarily characterized by the simple stem have developed a dichotomous disposition.

A few months ago there appeared in the *Times of India* the following account of what seems to be a celebrated specimen of a branching betel-nut palm: "A famous forked palm of Cayenne is giving signs of weakness. It has been proposed to cut it down, and preserve the trunk in the Natural History Museum at Paris after being shown in the World's Fair in 1889. This remarkable tree belongs to the genus *areca*, is about 100 feet high, and divides at a height of about 30 feet, the two stems being equal in height and diameter, and flourishing and fructifying like two isolated trees. The vegetable phenomenon is in a grove with some 400 other palms and shows nothing abnormal save its twin stems."

A still more curious instance is that of the wild date (*Phœnix sylvestris*) mentioned by Brandis, at p. 553 of his *Forest Flora of North-West and Central India*, as "growing in the Residency Garden at Indore, with a trunk 22 feet high to the first branch, and with 22 vertical closely packed branches." This specimen is also described according to Brandis, in the *Gardener's Chronicle* of 1874, p. 116, and our Honorary Secretary informs me that it is figured in the Agri-Horticultural Society's Journal 4. N.S. of 1873; but I have been unable to lay my hands on either of these works.

The accompanying illustration of the above mentioned tree is from a photograph obtained with the kind assistance of Mr. L. S. Newmarch. I am also informed by our Honorary Secretary, who recently visited Indore, that there are now only 12 branches, and that the tree shows no signs of having ever been cut for toddy.

Two instances of abnormal division in the stems of the common wild date (*Phœnix sylvestris*) have come under my own notice in Bombay.

One is in the compound of the bungalow belonging to the estate of the late Mr. A. G. DeGa, in which I am at present residing, on Altamont Road, Cumballa Hill. The other is in the compound of the house on the Pedder Road, formerly known as *Sea Scale*, when it was the residence of Mr. Wordsworth, but now called *Sea Gale*, and in the occupation of Mr. Nowrojee N. Wadia.

The former of these two specimens is a few yards to the north of my stable, close to the west side of Altamont Road. The tree is apparently of considerable age, and bears the marks of deep incisions for toddy. After growing in the usual way to a height of nearly 20 feet the stem has branched into four. The ramifications do not radiate from the axis of the original stem but are thrown out, so to

A BRANCHING DATE PALM (*Phœnix Sylvestris*)
GROWING ON CUMBALLA HILL, BOMBAY,
(*From a Photograph by Capt. E. Shopland.*)
Drawn by Miss STARLING.

speak, all in the same plane. There is no thickening of the original stem at the point of junction. The branches themselves are considerably attenuated just at this point, but almost immediately assume a vertical direction, and then all attain the thickness of the main stem. They are also all of about equal height, having grown some 12 feet from the point of junction to the base of the crown of foliage. Each branch bears flowers and fruit. A sketch of this tree had been made by Miss Starling, from a photograph by Capt. Shopland, for the Society's Journal.

The other specimen stands about 50 yards from the compound wall on the west of the Pedder Road, but being on rather elevated ground is plainly visible from the road. The stem, which in this instance also shows signs of having been tapped for toddy, has bifurcated at a height of about 12 feet from the ground. The southernmost of the two branches seems to form rather more of a right angle with the original stem at the point of junction than do any of the four branches in the other specimen. Excepting this, and the number of their branches, the two trees seem to grow in much the same manner.

I have also heard of an instance of a bifurcating cocoanut palm (*Cocos nucifera*) in the Mahim woods, but have not seen it. I have also heard of, but not seen, another instance of a bifurcating wild date (*Phœnix sylvestris*) in the jungle between Mount Nepean Road and the Malabar Hill Reservoir.

Brandis, at the page already cited, in the *Forest Flora*, speaking of the edible date (*Phœnix dactylifera*) says the branching stems are occasionally found in the Panjab, and that many palms have occasionally bifurcating stems and sometimes develop a large number of side branches. But the above are the only specific instances of abnormal branching in the simple stemmed species that I have been able to find or hear of. From them it would appear that the abnormal branching is always, if not strictly dichotomous, yet in multiples of two.* It would also appear that the branches, whatever their number, spring from the original stem at the same height. Next it would appear that they do not radiate in different directions around on the axis of the original stem. Lastly, it would appear from their being of the same length and girth that they are of equal age.

* An instance mentioned at p. 79 of *An Indian Olio* by General Burton of a *seven*-branching *Palmyra*, shows the ramifications are not always dichotomous. At the reading of the paper Mr. Kabraji mentioned another instance of a seven-branching cocoanut palm at Jabalpur near Naosari.

From all these facts I am inclined to infer, *first*, that these abnormal so-called "branches" are not ramifications in the strict sense of the word. That is, they are not lateral growths from a main stem which continues growing, but are divisions of the original stem itself; *secondly*, that all these divisions, whatever their number, originated simultaneously from the same cause; *thirdly*, that this cause also resulted in the disappearance of the first head of foliage which originally crowned the single stem.

The question then arises, what is the cause? This is not without an economic interest, for it is clear that if the cause be one capable of artificial application, it might be possible to double or quadruple the yield of fruit, nuts, or toddy, from a single tree.

Several possible causes suggest themselves. Stewart in his *Panjab Plants*, p. 244, as quoted by Brandis in the page already cited of his *Forest Flora*, supposes that "the branches are merely apparent, caused by seeds germinating in the axils of the petioles." Brandis, however, regards this theory as improbable. Certainly it would be difficult, on this supposition, to account for the facts above noticed of the apparent identity in age of the branches and the disappearance of the original crown of foliage.

But the abnormal branching might be due to atavism, or "throwing back," to a primeval type of ancestral palm, which naturally branched, a lineal descendant of which has survived in the Doum palm, or it might be an effort of evolution in the direction of development towards a branching type.

This raises a very interesting question in Darwinism with which I fear I am hardly competent to deal. The solution of it would seem to depend in a great measure on whether we are to regard the naturally branching palm as the survival of an ancient type or the development of a new one.

Judging from what we know of palæontological botany it would appear that the evolution of the dicotyledonous type from the acrogens through the cycadaceæ was already complete before the appearance of the palms. For besides their mosses, ferns, reeds, and cycades, we find in the coal measures of Great Britain, numerous remains of conifers and true exogenous trees. But it is not till the Tertiary period that there occurs any abundance of palms. From this I would infer that the palm does not come in as a link in the chain of the evolution of the dicotyledonous trees, and therefore that the branching of the palms is not to be regarded as an effort towards such evolution.

It may, however, be one in the evolution of a new type of monocotyledonous branching trees. In this sense the Doum palm would appear to be rather the forerunner of a new type than the descendant of an old one. For among the various species of fossil palms that have yet been discovered, I am not aware of one that is characterized by a branching stem. We should however remember that, owing no doubt to their softer texture, far fewer species of palms have been found than of the harder wooded dicotyledonous trees, and possibly among those which have been lost is the branching type.

Is then the abnormal branching of palms naturally single stemmed due to the efforts of individuals to develop a branching species in imitation of the Doum palm? I think not. The author of the article *Palma* in the last edition of the *Encyclopedia Britannica*, noticing the abnormal branching of palms, writes that it is "probably the result of some injury to the terminal bud at the top of the stem, in consequence of which buds sprout from below the apex." This view seems to be corroborated by most of the facts already mentioned, notably by the disappearance of the original foliage crown, by the apparent identity in age of the branches, and by the presence of incisions for toddy, at least in those Bombay specimens which I have described. These incisions, made just at the base of the crown of leaves, often result in its destruction and the death of the tree. Often however we notice merely a distortion of the single stem at the point of incision. It may well be that where the injury is greater than would merely result in a simple distortion of the axis of growth and yet not great enough to entirely destroy it, the young bud at the top of the tree divides into two or more, and hence the apparent branching of the stem at the point of injury and disappearance of the original single foliage crown.

It would therefore appear that the reduplication of the productive power of a tree could be artificially effected by the infliction of the right injury, care being of course taken to avoid such excess as would result in the death of the tree. Possibly too, if specimens of such artificially branching palms were produced in sufficiently large quantities over a sufficiently long period and propagated by careful selection, we might in time have another species of naturally branching palms. Only in striving to arrive at this laudable result let us be careful we do not first destroy all our existing species, and go down to posterity, as the rivals in fame of the old lady who killed the goose that laid the golden eggs.

MAULED BY A PANTHER.

By W. B. M.

I FIND from my diaries that I had killed fifty-six panthers and forty-six tigers—a total of one hundred and two felines—when I was defeated by a panther in the following manner:—

I had been camped for 14 or 15 days close to the great earthen dam of the Waghad lake, looking after my police and revenue subordinates, who had to collect and keep on the work 3,000 labourers required by the Engineering Department to secure the dam from injury during the rains, when I heard of a tiger being in the Ramsej hills, distant about ten miles. I at once despatched a tent to Tongaldhara, a small village below the hill, and sent out four or five of my police constables and the same number of sepoys to collect information of the tiger and mark him down if possible. The day after my arrival at Tongaldhara (31st May 1884), a villager came hurriedly to my tent about nine o'clock in the morning, announced that a tiger—it turned out to be a large panther—had been seen by the *paltyas* (watchers) at early dawn crossing over the hill, and that it had been satisfactorily marked down on the far side.

I started on my pony to ride round the hill, while I sent my policemen and the few beaters I could collect in Tongaldhara across it with orders to meet me at Dherrigam village.

When I arrived at Dherrigam I was pointed out the side of a hill, some 800 feet high, in which the so-called tiger was said to be marked down. This hill was crowned throughout its length with a massive natural wall of trap rock, varying from 150 to 200 feet high, having about its middle three or four deep rents or clefts forming passes from one side of the hill to the other, and through one of these the panther had been seen to enter the ravine at dawn.

Looking through my glasses I could discern 15 or 20 *paltyas* (watchers) posted in twos and threes at various commanding points on the hill side. The white head-dress or clothing of some rendering them conspicuous on the black rocks on which they sat, others easily distinguishable by their dark skins against the light bark of the tree on which they were perched, or against the yellow grass on which they squatted. It was impossible for the beast to move an inch without detection with all these fellows round the jungle. Beckoning down some of them from the hills, I enquired where the

beast was supposed to be. Those of the northern side asserted that they had seen him go into a *nalla*—dry torrent bed—on their side of the hill, and lie up in some cactus bushes (*sabri*), while those of the southern side declared he had gone down the hill and had disappeared amongst some large rocks under a clump of green and shady trees. The knowing ones of the village said that he had a lair in both places. The distance between the two points was between a quarter and a half mile, and deeming it impossible to organize a drive which would cover both, I made up my mind to drive the rocks below first, and then to drive the *nalla* above. The only thing against this arrangement was the small number of beaters, who were not more than 50, and who would have been quite lost on the extensive area to be covered. I consequently sent two police constables to neighbouring villages for more men, while I sat down to a light breakfast. After eating a hurried meal I went with an old villager to a large rock, under which the beast was said constantly to lie in the heat of the day. Nice cool quarters he had under it, but unfortunately he was not at home, so I returned to where the beaters were assembled, and was soon rejoiced at seeing about 75 more men turn up with my police constables. A consultation took place amongst all the elders of Dherrigam village, and it was finally settled that I was to take up my position in a wild fig-tree about a hundred and fifty yards beyond the rocks and clump of tree containing the lair of the animal.

An old villager, wearing a dark brown blanket, the fashionable head-dress of his caste, and affording protection to his head and shoulders from the sun, was sent with me, as he was reputed to know exactly where to place me. When I got to the tree in question I objected to get into it, as no portion that would bear my weight was five feet from the ground, and it practically afforded no protection, while it was a most awkward one to shoot from; I therefore said I would stand on the ground, where my aim would be steadier. The old fellow declared the beast's path lay directly under the tree, and the panther would pass *pote-a-kal* (under my belly) if I would only get up the fig-tree. Over-persuaded by such arguments I got astride a large horizontal branch, while my companion climbed high up the small shoots over my head, and taking my spare rifle well out of reach, ensconced himself in the green branches at the top of the tree. I so placed myself as to face the beast as he came along under the tree, as I considered it very

probable that if I did not prevail on him to stop before he came up to me he might have a pleasant few minutes' amusement with my legs dangling down to within a few feet of the ground.

The first shout of the beaters had scarcely echoed up the hill when my friend on the tree above me remarking, "There goes the tiger," pointed upward, and following the direction of his finger I saw a very fine panther one hundred and fifty or two hundred yards off trotting with long and rapid strides up the hill to my right. Sitting as I was astride a large branch it was impossible for me to turn round sufficiently, get my rifle to my shoulder, and bring it to bear on an object above and well to my right. Nevertheless I fired at him from my cramped position, and I believe I hit him, as he turned round and snapped at his hind quarters, and some *paltyas* in trees who saw him pass close declared they saw blood on his flanks. He tried to pass over the hill, but was turned by *paltyas*, and he proceeded to lie up in some rocks under trees directly below the high cliff crowning the hill. I hurried up the hill to head him, and getting the beat so arranged as to drive him towards me, I knelt on the ground, rifle in hand, directly in his road to cross over the hill.

I had not been long in position when I saw his beautiful yellow skin shine in the bright sunlight as he descended a dip in the path under the cliff, coming straight towards me. When he rose out of the dip, to my surprise, he suddenly pulled up and looked dead in our direction. I whispered to the old fellow behind me, holding my spare rifle, that it must have been the confounded dark blanket over his head that the panther had seen. He declared the blanket was not to blame, but the men above us on the rocks, and looking up I perceived, for the first time, some half-dozen beaters shewing well down to their waists above the high rocks over us. The panther then lying down broadside on in the open with his tongue hanging out, kept his head turned round in our direction showing that he distinctly saw us in spite of the bright glare of the sun. I was nearly tempted to fire at him as he was not more than 80 yards off, but a shot at a sitting animal is always a difficult one, and I dreaded putting him back on the beaters, some of whom he would have been sure to maul, if not kill. As the drive came on he quietly slipped down the hill and I went after him.

When thus following him some men in a teak-tree, hailing me, told me they had seen him sneak into some cactus bushes and long grass

close by, and that he had certainly not passed out or gone beyond. I took up a position from which I could command the small piece of jungle pointed out, and was having it driven when a police constable, Daghru, shouted from above that he had discovered a large hole with panther foot-marks going into it, and to corroborate the statement he brought me some hairs found at the entrance of the hole which, on examination, I saw were long and white, so, remarking that they looked more like hyena's than panther's hair, I told him to see if there were any yellow or black ones about. I, however, clambered up the hill after the constable, having one loaded rifle carried by the Kotwal of the village close by me. The other I unloaded, as there was some climbing and nasty ground to be got over, and from accidents I had seen, I always dreaded rifles going off when in the hands of ignorant natives. The bearer of this second weapon I told to come on as quickly as he could.

I went straight to the earth where Daghru was, and satisfied myself that the pugs of a panther distinctly led into the hole. I was then taken to a second hole about 20 or 30 yards distant, which, the villagers asserted, communicated with the first. While here, taking a pull at my drinking water and making arrangements to light a fire of grass and green leaves to smoke the brute out, in order that I might shoot him as he escaped at the other end, the police constable, Daghru, came running round in a great state of alarm and told me that two (*baghs*) panthers, had come out of his end of the earth, were simply playing the mischief amongst the beaters, and that unless I hurried round the beasts would get away.

I seized my rifle from the hands (of a native standing close by me), and ran to about as strange a scene as it was ever my lot to witness. The panther had come out of the hole with a rush amongst the beaters crowding round; many of these were in the act of bolting as hard as they could down the hill, others were lying about, having gone in the knees from funk, and fallen in the extraordinary way natives sometimes do, and the last man standing was going over backwards before the infuriated panther when I arrived.

Many seconds were not allowed me for contemplation of this scene as the panther charged straight at me. Owing to the number of beaters about—some on the ground, some picking themselves up, and some bolting—it was impossible for me to fire without the greatest risk of shooting one or two of them. I consequently had to wait until the panther was within a few feet of me, and I then

put my rifle down to his head, expecting to roll him over like a rabbit (as I had succeeded in doing on other occasions), and then place my second bullet pretty much where I pleased. To my horror there was no report when the hammer fell! The next moment the panther, with an angry roar, sprang on me. Hanging on with the claws of one fore-paw driven into my right shoulder and the other round me, he tried to get at my head and neck, but I fortunately prevented this by raising my left arm which he instantly seized in his huge mouth. I shall never forget his sharp, angry roar, the wicked look of the greenish yellow eyes within six inches of mine, the turned-back ears, his fœtid breath upon my cheek, and the feeling of his huge fangs closing to the bone through my arm above the elbow.

I endeavoured, by giving him my knee in the stomach, to make him let go. Those who have ever kicked a cat, can imagine what little effect this had. It was more like using one's knee to a foot-ball than anything else. The panther, with a roar, gave a tremendous wrench to my arm, hurled me some five paces down the side of the hill prone on my face, bringing my head in contact with a tree. Stunned and insensible, I lay some seconds on the ground, and the brute, thinking me dead, fortunately did not worry me, but, passing over me, went for the retreating police constable who had brought me into the difficulty. I remember when I came to raising my head from the ground, leaning my forehead against the tree, and smiling, with a certain feeling of grim satisfaction, when my eye caught the retreating form of the constable and the pursuing panther down the hill, and I thought the policeman's turn had come. In his precipitate flight, however, this constable went apparently also in his legs, for he fell and thus escaped a mauling.

During the scrimmage the beaters, completely losing their heads, bolted here, there, and everywhere, and neither they nor the constables made the slightest effort to drive the beast off me. The patel or head of the village, clapping his hand to his mouth, shouted at the top of his voice: "Oh, my wife is a widow, my wife is a widow," meaning, I conclude, that if I were killed an avenging but just Government would hang him, while, if I survived, in all probability I would at once dispose of him in some other but equally effectual manner.

When the panther had passed away police constable Narayen, raising me from the ground, inquired if I was much hurt. I replied that I feared I must be. He opened my coat and flannel shirt and

laid bare my gnawed arm and clawed shoulder, bleeding profusely. Feeling faint from loss of blood, I got Narayen to wrap his head-dress round and round the arm and pour cold water on it, and giving him strict injunctions to lay me flat and pour water on my head in case I fainted (natives invariably prop you up in a sitting position when you faint, and there keep you until you die !) I began the descent of the hill. I reached my little nag saddled and waiting for me, and mounting it, I simply turned her head towards home and flew over the five miles of broken country track to my camp at Tongaldhara, the other side of the hill. As I sped through the air the wet bandages on my wounds felt icy cold and refreshed me, so that I could not believe I was much hurt. The wayfarers on the road must have been astonished at the appearance of their District Magistrate and Collector as I galloped along; and, indeed, I observed that they all pulled up and looked after me as I passed bleeding from my forehead and with the arms of Narayen's coat which I had merely buttoned at the neck and his pagri flying in streamers behind me on the breeze. When I reached my tents the scene was one rather calculated to unnerve even a stronger man than me. All my servants, butler, cook, mate, dressing boy, &c., &c., gathering round, as I bathed the wounds in cold water and re-wet the bandages, and crying piteously, told me I never could recover from such deep injuries. I tried to persuade them I was all right, and as if to disprove their mournful predictions I became quite elated in spirits, and after swallowing a cup of tea, I started, with my dressing boy, in my pony trap, for Nasik. The lad driving, rattled over the ten miles of good road almost as fast as the mounted policeman I sent ahead to summon the Doctor to my house, and two hours and a half had not elapsed from the time of my mauling before I was in the hands of the Civil Surgeon of the Station.

The Doctor probed the teeth wounds in the arm and found that at the back of the arm ran right to the bone and was an inch and a half deep. The two wounds on the inner side, in or close to the biceps, were one an inch and a quarter and the other an inch deep. The claw wounds on the right shoulder were not serious, and had fortunately just missed the large artery near the collar bone, injury to which would have resulted in my bleeding to death in a very few minutes.

Carbolic acid and water lotion bandages were applied, and these my servants kept wet night and day. My head, as the Doctor feared

concussion from my symptoms, was kept deliciously cool with an eau-de-cologne and water bandage. For three or four days I continued in a very exhausted state. I was incoherent and more or less off my head. I well remember how, in my frightful dreams, the panther constantly came at me again, and how fiercely I struggled to get my hands and feet (which I imagined tied) free, and how ultimately I awoke bathed in perspiration, having got rid of my horrible nightmare. From the poisonous wounds sinuses formed which had frequently to be laid open with the lancet. On the 27th day I was out of bed and moved to Bombay to join a new appointment. One wound gave trouble longer than the others, but having been turned inside out, as the Doctor termed it with the lancet a second time, all proceeded satisfactorily, and, thanks to the great care and attention of my medical adviser, within two months from the occurrence of the mishap, the wounds were healed up and even a sling was dispensed with.

Here a word of advice to those who, like myself, have the misfortune to be mauled. Remember that teeth and claw wounds of these large felines are poisonous, from their eating flesh and carrion, and that being punctured wounds they must be kept open at the mouth and made to granulate from below; so sure as they close over at top sinuses will form and the wound and sinuses must be laid open with the lancet. I should have been spared much pain if I had borne the above in mind, and not hurried to have the wounds closed over for me to get about.

Asked how it occurred, all I can reply is that I can't say with certainty whether a cartridge missed fire, or whether, when I hurriedly seized the rifle from the hands of the bearer, I seized the unloaded one. It is possible that the village Kotwal, hearing of two panthers, and the utter rout of the beaters, lagged behind with the loaded rifle and allowed the unloaded one to come on with me. When I was mauled the rifle was knocked out of my hands, the hat off my head, and even the watch and cartridges out of my pockets, and I did not see the rifle again until I rose from my bed three weeks after the accident. It is consequently impossible for me definitely to explain the mishap, though, when I examined my rifle, I certainly found the claw-marks of the panther on my twelve-bore rifle, while I am under the impression that it was my central fire express that I loaded before commencing my ascent of the hill.

ZOOLOGICAL NOTES.

A CURIOUS INSTANCE OF FRIGHT.

In the last number of the Journal I noticed that Mr. Vidal, in his letter on "Poisonous Lizards," mentions several cases of the effects of fright on a native when under the impression that he had been bitten by some poisonous reptile. The following incident, which occurred at one of my camps, may be interesting. One evening one of my subordinates told me a coolie had been bitten by a snake; I went and examined the man, who said he had been bitten on the inside of the big toe. Careful examination, however, showed no puncture or even scratch. To put the man's mind at ease I admnistered a large dose of brandy. The man did not seem frightened, his chief idea being to go and kill the snake. He gradually got worse, and in a quarter of an hour he was insensible, skin cold. froth at the lips, quite rigid, and most remarkable of all, his eyes were insensible to light. His pulse was, however, fairly steady and good. I could do nothing more for him, but one of the coolies came up and asked to say *Mantras* over him. Having got permission, he took a small *lota* of water and standing quite six feet from the man began to recite, every now and then sprinkling a little water towards, but not on, the man. In ten minutes the coolie was walking about perfectly well. There is in my mind no doubt that the saying of the *Mantras* cured the man, not from any inherent efficacy in them, but simply because the man's faith in them was greater than the fear of the snake poison.

F. E. DEMPSTER,
Myingyan, Upper Burmah.

26*th July* 1888.

A FOX EATING WHITE-ANTS (*TERMITES*).

Dr. Stewart, of the Poona Horse, who is a careful observer, writes as follows on 7th November 1888:—

"On the 5th instant, while breaking a young horse, I came upon a fox in a ditch by the side of the road. There had been rain, and he was on a white-ants' nest, from which numbers of the winged white-ants were issuing. About 40 crows were crowding round him, barely keeping "at arm's length" and hardly afraid of him. As I came up, at a walk, he retired into a field about 20 yards, but almost immediately turned and went back. All the crows on this rose from the nest with a noise that would have alarmed most animals, but he only hesitated a moment and then ran eagerly and quickly to the nest again. I have not the slightest doubt he was eating the white-ants. I passed within four yards of the nest and saw there was no carrion of any sort on it, for the ground was bare; on the other hand his very eager manner and the position he took up on the nest, left no doubt in my mind what he was after. Had I been able to do so, I should have watched him."

It is not at all unlikely that the fox was engaged in this excellent work of destruction, as the number of birds and animals, which feed on these excellent little insects, is very large. I once saw a squirrel at Matheran scratching the redearth off a dead tree and greedily devouring the white-ants beneath, which greatly surprised me, as I had always supposed the squirrels to be strict vegetarians.—*Editor.*

PROCEEDINGS OF THE SOCIETY.

PROCEEDINGS OF THE MEETING HELD ON 6LH AUGUST 1888.

THE usual monthly meeting of this Society took place on Monday, the 6th August, and was largely attended. Dr. D. MacDonald presided.

The following new members were elected :—Captain W. St. John Richardson, Mr. W. S. Owen, Khan Saheb Manockjee Dhanji, Mr. G. K. Betham, Mr. Goverdhundass Khatao Mackunjee, Lieut. R. H. Light, Dr. E. H. Brown, Dr. Monks, Mr. G. A. Kittredge, and Dr. Barry.

The Honorary Secretary, Mr. H. M. Phipson, then acknowledged the following contributions to the Society's collection :—

CONTRIBUTIONS DURING JULY.

Contribution.	Description.	Contributor.
1 Snake (alive)	Bungarus arcuatus,	Dr. da Gama.
Several rare Birds' Nests from the North Cachar Hills.....	Palm-Roof Swift, Grey-headed Broad-Bill, Little Spider-Hunter, Mrs. Goulds' Honey Sucker Scarlet-backed Flower Pecker. Golden headed Babbler and Rufous-bellied Bulbul ...	Mr. E. C. S. Baker, through. Lieut. H. E. Barnes.
2 Snakes.....	Chersydrus granulatus and Cerberus ryhnchops.	Mr. W. S. Hexton.
Coral	From Red Sea.....	Dr. E. Littlewood.
A Piece of Bark Cloth		Mrs. Ashdown.
1 Scaly Ant Eater.....	Manis pentadactyla	Mr. Fred. Wright,
1 Panther Cub (alive).....	Felis pardus	Do.
1 Mongoose (alive)	Herpestes griseus	Mr. R. H. Light.
1 Chameleon (alive)	Chameleo vulgaris	Mrs. Aston.
1 Cobra (alive).....	Naga tripudians	Major Bissett.
1 Sea Snake (alive)	Enhydrina bengalensis ...	Mr. H. J. Hemming.
2 Young Porcupines (alive)	Hystrix leucura	Mr. H. Barrett.
1 Black Sloth Bear (alive).	Ursus labiatus	Lieut. F. Sapte.
1 Cobra (alive)	Naga tripudians	Mr. G. Carstensen.
1 Chameleon	Chameleo vulgaris	Dr. E. H. Brown.
3 Guinea Pigs (alive)	Cavia cobaya	Mr. H. A. Coggan.
1 Sun Bear (alive)	Ursus malayanus from Borneo.	Sig. G. Ceccarelli, through Mr. F. Bozzoni.
1 pair Red Jungle Fowl ...	Gallus ferrugineus	Mr. W. S. Price.
Nest and Eggs	Black-capped Black Bird., White Winged Ground Thrush and Blue-breasted Water Rail.	Mr. H. M. Hewett.
1 Snake	Tropidonotus punctatus...	Mr. Lennane.

CONTRIBUTIONS TO THE LIBRARY.

Birds of British-Burma (Oates), from Captain Shopland.

The International Scientists' Directory, from Dr. Dymock.

Records of the Geological Survey of India, in Exchange.

Journal of the Asiatic Society of Bengal, Vol. LVII., Part II., Nos. 1, 2, in Exchange.

Verhandhingen der Zoologisch Botanischen,

Gersellschaft in Wien. XXXVIII. Band. Quartal. I. II.

Miss La Touche exhibited a fine specimen of the Hunting Leopard (*Felis jubata*) or *Chita*, which she had reared from a cub. The animal, which was perfectly tame, was much admired by all present. Mr. E. L. Barton also exhibited two tigers' heads mounted by him for members of the Society since last meeting.

THE PROPOSED ZOOLOGICAL GARDEN.

The Honorary Secretary, Mr. H. M. Phipson, stated that since the last meeting of the Society no reply had been received from Government as to the site asked for, and that the Committee was, therefore, not yet in a position to lay before the members for their approval any definite proposals with regard to the contemplated Zoological Garden. With a view, however, to test the popularity of the scheme, a list had been started in the local newspapers of persons who would be willing to support the project by becoming life-members of the Society on payment of Rs. 150, on the understanding that they would be relieved of all further payments, and be entitled to a free entrance to the Garden to themselves and two friends. The *Times of India* had most generously headed the list with a subscription of Rs 500, and the amount had in less than one month risen to Rs. 51,150. (Cheers.) T. E. Lord and Lady Reay had added their names to the list as well as their Royal Highnesses the Duke and Duchess of Connaught. H. H. the Rao of Cutch, Sir Dinshaw Maneckjee Petit and another well-known Parsee gentleman had promised Rs. 1,000 each, and it was proposed that donors of such amounts should be elected patrons of the Society with all the privileges of life-members, and also that cages built with the money should be named after the donors.

The Honorary Secretary further stated that no reply had been received from the Municipal Commissioner to the proposals made by the Committee, but that the subject had been discussed at several meetings of the Town Council and Corporation. In the opinion of the Committee the site asked for *was the only one in Bombay on which a popular and successful Zoological Garden and Aquarium could be made.* The land had for many years been partially occupied by cattle keepers, and was at present in a most insanitary condition. A Zoological Garden, if properly laid out and well kept, could not possibly be a source of annoyance to any one. In support of this assertion the Honorary Secretary drew the attention of those preseut to the largest collection of wild animals in the world that belonged to the Zoological Society of London, which may now be said to be in the heart of the Metropolis. No complaints had ever been made of any annoyance arising from the London Zoological Garden, and the best evidence of this was the fact that the houses on the north and north-east of Regent's Park, facing the Menagerie, command very high rents. Promises of specimens had been received from all parts of the country, and the Committee were confident that if the desired site were obtained, one of the most picturesque gardens in the world could be made thereon, which would be a credit to Bombay, and furnish the inhabitants with a constant source of amusement and instruction. (Applause.)

Mr. Reginald Gilbert then read an interesting paper, entitled :—"Notes on Sambhur and Sambhur Stalking," which will be found in another part of this number.

PROCEEDINGS OF THE MEETING HELD ON 6TH SEPTEMBER.

The usual monthly meeting of the members of this Society took place on Monday, the 6th September, Mr. G. Carstensen presiding.

The following new members were elected :—

Mr. E. Hadyn, Dr. Boyd, Dr. Sinclair, Mr. W. B. Mulock, C.S., Mr. C. J. Maltby, Captain G. Budgen, Mr. A. R. M. Simkins, Mr. F. G. Richardson, Brigadier-General LaTouche, Mr. H. E. M. James, C.S., and Mr. B. W. Blood.

The Rev. A. K. Nairnes was elected an honorary member of the Society.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections :—

CONTRIBUTIONS DURING AUGUST.

Contributions.	Description.	Contributor.
A Collection of Lizards and Bats.	From Burmah	Marchese G. Doria.
2 Hares (alive)	Lepus nigricollis	Mr. W. Stephens.
1 Cashmere Mouse-Hare ..	Lagomys sp	Mr. H. Littledale.
Skin, Nest and Eggs of White-browed Bunting.	Emberiza cia	Do.
Skull of Black-necked Stork.	Mycteria australis.....	Do.
2 Eggs of Chukor Partridge.	Caccabis chukor	Do.
2 Eggs of Marsh Tern	Hydrochelidon indica	Do.
1 Egg of Himalayan Snow Cock.	*Tetragalious* himalayensis..	Do.
3 Snake's Skins.....	From Natal	Miss Lloyd.
1 Cobra (alive)	Naga tripudians	Mr. G. Carstensen.
8 Sea Snakes (alive)	Enhydrina bengalensis, Hydrophis diadema.	Mr. Vincent McCarthy, thro' Capt. Falle.
1 Purple Coot (alive)	Porphyris poliocephalus ...	Mr. W. Shipp.
2 Monkey-mouthed Sharks	Stegostoma tigrinum	Mr. W. W. Barr.
1 Porcupine's Skull	Hystrix leucura	Do.
1 Snake	Tropidonotus punctatus ...	Mr. Lemane.
A quantity of Turtles' Eggs.	Chelonia virgata	Dr. D. A. D'Monte.
1 Mongoose Skull	Herpestes griseus	Mr. C. J. Maltby.
1 Tailor Bird (alive)	Orthotomus sutorius.....	Sergeant-Major Webb.
1 Flamingo (alive)	Phœnicopterus antiquorum.	Mr. J. Littlewood.
1 Chameleon	Chameleo vulgaris	Mr R. H. Madan.
1 Monitor (alive)	Varanus dracæna	Mr. Barrett.
1 Pair Oryx Horns	From Africa	Brig.-Genl. LaTouche
1 Pair Khudoo Horns	Do.	Do.
1 Python (alive)	Python reticulatus	Capt C. H. Bingham.
1 Indian Antelope's Head...	A Doe with horns	Major J. H. Yule.

CONTRIBUTIONS TO THE LIBRARY.

Catalogue of the Frogs, Toads, and Cæcilians of S. India (Edgar Thurston)	From the Author.
Proceedings of the Linnæan Soc. of N. S. Wales, Vol. III., Part I.	In Exchange.
Astor : or Sport and Travel in Cashmere (H. Liscomb)	Mr. T. J. Bennett.
Journal of Comparative Medicine and Surgery. Vol. IX. No. 3..	In Exchange.
Annali del Museo Civico de Genova, Series II., Vols. I to V.	Marchese G. Doria
Proceedings of the Royal Society of Edinburgh, 1883 to 1887 ...	In Exchange.
Knapsack Manual for Sportsmen in the Field. (Ward.)	Mr. J. A. Murray.
Plants and Drugs of Sind. (Murray.).....	Do.
Economic Products of India	Do.
List of Indian Economic Products	Do.
Catalogue of the Exhibits in the Indian Section of the Fisheries Exhibition	Do.
The Birds of Southern Afganistan. (Swinhoe)	Do.
The Vertebrate Zoology of Persia. (Murray)	Do.
Fauna of British India. Mammalia. (Blanford.)	From the Author.

MINOR CONTRIBUTIONS FROM

Mr. Lambert, Mr. F. H. Coutts, Mr. H. W. Barrow, Mr. H. Bromley, Mr. W. F. Jardine, Mr. E. S. Cooper, Mr. B. W. Elood, Mr. J. W. Scott.

THE PROPOSED ZOOLOGICAL GARDEN.

Mr. H. M. Phipson stated that the Committee were still waiting for a reply to the letter they addressed to Government on the 15th June last with reference to the proposed site for a Zoological Garden. In the meanwhile about Rs. 54,000 had been subscribed by the members of the Society and those who were willing to join in the event of the scheme being carried out.

PROCEEDINGS OF THE MEETING HELD ON 1ST OCTOBER 1888.

THE usual monthly meeting of the above Society was held on Monday, the 1st October 1888, Dr. D. MacDonald presiding. The following new members were elected :—Mr. J. McLeod Campbell, Lieutenant C R. Boniface, and Mr. P. R. Mehta.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collections :—

CONTRIBUTIONS DURING SEPTEMBER.

Contribution.	Description.	Contributor.
1 Hawk (alive)	Astur badius	Mr. Chubildas Lulloobhoy.
2 Florican's Eggs & 2 Rain Quail's Eggs.	From Kharaghora	Mr. E. P. Close.
3 Snakes (alive)	Silybura macrolepis	Mr. E. Butcher.
4 Cobras (alive)	Naga tripudians	Mr. P. R. Mehta.
2 Snakes (alive)	Eryx johnii and Ptyas mucosus.	Do.
1 Monitor	Varanus dracæna	Mr. R. P. Smith.
1 Porcupine's Skull	Hystrix leucura	Mr. W. W. Barr.
2 Young Manuras	Paradoxurus musanga	Mr. W. S. Owen.
1 Monitor	Varanus dracæna	Mr. F. H. Coutts.
1 Large Turtle	Chelonia viridis	Dr. de Monte.
6 Snakes	From Mhow	Lieut. R. H. Light.
1 Snake (alive)	Eryx johnii	Capt. J. B. R. Butler.
1 Manura (alive)	Paradoxurus musanga	Dr Gonsalves.
3 Pieces of Flexible Sandstone.	From Rewari	Major Bissett.
A number of Insects and Lizards.	From Natal	Miss Lloyd.
1 Monkey (alive)	Macacus radiatus	Mr. P. E. Myer.

MINOR CONTRIBUTIONS FROM

Mrs. Simkins, Mr. Kaikobad C. Dinshaw, Mr. C. B. Lynch, Mr. J. W. Scott, Mr. W. Gaye, Mr. J. O'Connell, Mr E. T. Ansell, Rev. R. Stothert, Mr. W. H. Bushby, Mr. W. W. Squires, and Mr. E. P. Close.

CONTRIBUTIONS TO THE LIBRARY.

Catalogue of the Moths of India (Coles and Swinhoe) .....From the Authors
Records of Geological Survey of India .....In exchange.
Rough Notes on Travel and Sport in Cashmere and Little Thibet...From the Author.
Proceedings and Transactions of the Royal Dublin Society, Vol. V.,
Nos. 7 and 8. Vol. VI., Nos. 1 and 2.....In exchange.

Mr. E. L. Barton exhibited a large boar's head mounted by himself, which was much admired.

Mr. E. H. Aitken then read a paper entitled "The Natural History of a Voyage from Liverpool to Bombay," which will be found in this number.

PROCEEDINGS OF THE MEETING HELD ON 11TH DECEMBER 1888.

The usual monthly meeting of the members of this Society took place on Tuesday, the 11th December, Dr. Lisboa presiding.

The following new members were elected :—The Earl of Scarborough, the Hon'ble Mr. Justice Bayley, H. H. Maharaja of Rutlam, H. H. Samat Singjee, Miss Ada Brooke, Lieut. F. W. Wodehouse, Dr. Crofts, Mr. F. Reddie, Mr. John Bristed, Mr. W. H. Bushby, Mr. Dorab J. Tata, Mr. Erasmus Beynon, Mr. T. R. Fernandez, Dr. Banks, Mr. W. Leedamur, Mr. R. M. Betham, B.S.C., Mr. A. D. Younghusband, C.S., Dr. J. P. Greany, M.D., Mr. R Bateman Smyth, C.E , Mr. Camulsey Premjee, Mr. R. E. Candy, C.S., Mr. Framjee Nusserwanjee, Col. H. deP. Renwick, Mr. M. C. Lockie, Mr. Bomanjee Dinshaw Petit, Mr. R. B. Stewart, C.S., Mr. Geo. E. Pilcher, Mr. J. Muir-Mackenzie, C.S., Mr. R. J. Rustomjee, Mr. L. H. Spence, Mr. G. McCorkell, C.S., Mr. Jamsetjee Cursetjee Powalla, Mr. G. Cotton, Mr. Alex. Menesse, Mr. H. W. Uloth, Mr. T. C. H. White, Mr. Alex McKenzie, Mr. W. H. Middleton, Mr. J. Westall, Dr. R. Manser, Mr. M. H. Scott, C.S., Mr. N. M. Patell, and Mr. E. J. Ebden, C.S.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged the following contributions to the Society's collection :—

CONTRIBUTIONS DURING OCTOBER AND NOVEMBER.

Contribution.	Description.	Contributor.
Set of Cock-fighting implements.	Used by the natives in the Kurnool District.	Mr. H. M. Hewitt.
1 Malabar Red Squirrel	Sciurus malabaricus	Mr. T. Thornburn.
2 Squirrels (alive)	Sciurus palmarum.....	Mr. A. J. Lennane.
A quantity of Insects	From Raipore, C. P.	Mr, J. A. Betham.
Do. do.	From Surat.....	Mr. W. S. Hexton.
A quantity of Insects and Reptiles.	From Bushire.....	Mr. D. J. Wilson.
1 Snake	Silybura macrolepis	Mr. G. W. Roughton.
1 Night Jar (alive)	Caprimulgus asiaticus	Mr. R. J. Elliott.
1 Dusky-horned Owl	Bubo coromandus (from Baroda.)	Mr. J. M. Henry.
1 Cat Fish (57 lbs.)	Caught in the Bhima	Dr. Stewart.
1 Nicobar Pigeon	Callanas nicobarica	Capt. Carpenter, R.N.
1 Krait (alive)	Bungarus arcuatus	Mr. H. Littledale.
Skin and Skull of Jungle Cat.	Felis chaus	Mr. D. George.
1 Large Black Sand Snake (alive).	Erix johnii	Mr. P. R Mehta.
1 Yellow-breasted Ground Thrush (alive).	Pitta bengalensis	Capt. Shopland.
1 Indian Bee-Eater (alive)	Merops viridis.	Mr. T. Thornburn.
1 Pit-Viper	Trimeresurus annamalensis.	Miss LaTouche.
4 Snakes	Tropidonotus quincuntiatus, Tropidonotus plumbicolor, Lycodon aulicus, and Ptyas mucosus.	Mr. G. W. Roughton.

Contribution.	Description.	Contributor.
1 Manura (alive)	Paradoxurus musanga	Mr. H. Barrett.
1 Chameleon (alive)	Chameleo vulgaris	Mr. N. S. Symons.
1 Monkey (alive)	Macacus silenus.....	Mr. F. L. Charles, C.S.
1 Aviary	(Sundry birds)	Do
1 Snake	Daboia elegans	Mr. Justice Jardine.
1 Flamingo	Phœnicopterus antiquorum	Dr. Boccarro.
1 Sea Horse	Hippocampus sp.	Capt. Macaulay.
1 Snake	Typhlops porrectus	Mr. James Moore.
Skull of Albatross	Diomedea sp.	Mr. Jas. Mitchell.
1 Chameleon (alive)	Chameleo vulgaris.....	Capt. H. D. Rossoter.
1 Snake	Daboia elegans	Mr. F. Steers.
A collection of Shells and Insects.	From Fiji	Mr. E. Wimbridge.
1 Pair of Lemurs (alive) ..	Lemur mongoz	Mrs. McClelland.
1 Cotton Teal	Nettopus coromandelianus.	Mr. Prideaux.
2 White-Eyed Pochards.....	Aythya nyroca	
2 Snakes	Tropidonotus plumbicolor .	Brig-Genl. LaTouche.
	Passerita mycterizans	
1 Pair of Loris (alive)	Loris gracilis	By exchange.
1 Pair of African Love Birds (alive).	Psittacus sp.	Mr. Tytler.

MINOR CONTRIBUTIONS FROM

Colonel Westmacott, Colonel Hunter, Mr. Tytler, Mr. Trevor Smith, Miss LaTouche, Mr. E. L. Butcher, Dr. Munday, Mrs. M. C. Turner, and Major Babington Peile.

EXHIBITS, &c.

The Hon'ble Mr. Justice Birdwood exhibited various specimens of rare plants from Mount Abu.

The Honorary Secretary exhibited some specimens of the Amphioxus—the lowest form of vertebrate life—which had been received from the Zoological Station at Naples through Mr. W. F. Sinclair, C.S.

The Honorary Secretary also read some interesting zoological notes by Dr. Stewart of the Poona Horse, and by Mr. F. E. Dempster.

Mr. W. E. Hart then read a paper, communicated by Mrs. W. E. Hart, entitled 'Notes on some Branching Palms," which will be found elsewhere in this number.

Bombay Natural History Society.

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H. E. the Right Honorable Lord Reay, G.C.I.E., LL.D., F.R.G.S.

Vice-Presidents.

Dr. D. MacDonald, M.D., B.SC., C.M.
The Hon'ble Justice Birdwood, M.A., LL.M. (Cantab.)
Dr. G. A. Maconachie, M.D., C.M.

Hon. Secretary.

Mr. H. M. Phipson, C.M. Z.S.

Hon. Treasurer.

Mr. E. M. Slater.

Editor.

Mr. H. M. Phipson, C.M. Z.S.

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Dr. D. MacDonald.
Col. C. Swinhoe.
Rev. F. Dreckmann, S.J.
Dr. Kirtikar.
Mr. J. H. Steel, A.V.D.
Mr. E. M. Slater.
The Hon. Mr. Justice Birdwood.
Mr. G. W. Vidal, C.S.
Mr. W. F. Sinclair, C.S.
Dr. Edith Pechey.
Lieut. H. E. Barnes.
Mr. J. C. Anderson.
Mr. E. L. Barton.

Mr. H. M. Phipson, *ex-officio*.

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President—Mr. R. A. Sterndale, F.R.G.S., F.Z.S.
Secretary—Lieut. H. E. Barnes.

2nd Section.—(*Reptiles and Fishes.*)

President—Mr. G. W. Vidal, C.S.
Secretary—Mr. H. M. Phipson, C.M. Z.S.

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President—Colonel C. Swinhoe, F.Z.S., F.L.S., F.E.S.
Secretary—Mr. E. H. Aitken.

4th Section.—(*Other Invertebrata.*)

President—Dr. G. A. Maconachie, M.D., C.M.
Secretary—Mr. J. C. Anderson.

5th Section.—(*Botany.*)

President—The Hon'ble Justice Birdwood, M.A., LL.M. (Cantab.)
Secretary—Surgeon K. R. Kirtikar, F.S.M. (France), F.R.C.S.

Bombay Natural History Society.

LIST OF MEMBERS.

January 1888.

NAME.	RESIDENCE.
Abbott, Rev. J. E.	...Bombay
Adam, Hon. F. Forbes	...Bombay
Adams, J. B. D.	...Tanna
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Anderson, J.	...Mahim
Anderson, J. C.	...Bombay
Anderson, W. C.	...Bombay
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Andrewes, H. E.	...Belgaum
Appleton, A. F. (A.V.D.)	...Kirkee
Arnott, Surgeon-Major J.	...Bombay
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Barton, E. L.	...Bombay
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Begbie, J. A.	...Bombay
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Bengallee, S. S. (C.I.E.)	...Bombay
Bergl, Louis	...Bombay
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Betham, W. G.	...Nasik
Beyts, C. A.	...*Europe*

NAME.	RESIDENCE.
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Bingham, Captain C. H.	...Rangoon
Birdwood, the Hon'ble Mr. Justice ...	...Bombay
Bishop, Capt.	...Europe
Bisset, Col....	...Bombay
Blackwell, G. F.	...Tanna
Blackwell, H. F.	...Bombay
Bousted, Surgeon-Major R.	...*Europe*
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Bromley, Thos.	...Mahim
Brown, J. W.	...Bombay
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Buckland, H. W.	...Bombay
Bullock, W.	...Bandora
Butcher, L. H.	...Egatpura
Butler, Capt. J. B. R.	...Deesa
Byrne, C. H.	...Bombay
Calthrop, E.	...Bombay
Campbell, E. W.	...Bombay
Campbell, John	...Bombay
Cane, Rev. A. G.	...Poona
Capel, E. L. (C.S.)	...Sholapore
Carroll, E. B. (C.E.)	...Bombay
Carstensen, G.	...Bombay
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Chalmers, H.	...Bombay
Chambers, F.	...Bombay
Channer, Dr. O. H...	...Belgaum
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Cheetham, J.	...Bombay
Chrystal, J. S.	...Hubli
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Clifton, C. N. (C.E.)	...Kaira
Close, E. P....	...Kharagora
Cobbold, H. R.	...Bombay
Collie, Surgeon R....	...Bombay
Collister, J. G. H....	...Bombay
Colvin, E. G. (C.S.)	...Calcutta
Conder, H....	...Bombay
Connop, W. A. (R.N.), H. M. S. "Bacchante"	...Bombay
Conroy, A....	...Bombay
Cooke, Dr. T.	...Poona
Cooper, C. P.	...*Europe*

NAME.	RESIDENCE.
Cornforth, J. P.	...Bombay
Crawford, Arthur (c.s.)	...Poona
Crawford, L.	...Bombay
Crawley-Boevey, A. W. (c.s.)	...Bombay
Crawley, C. E.	...Lahore
Creagh, Captain R. P.	...Bombay
Cuffe, T. W.	...*Europe*
Cumberley, N. R.	...Akola
Curjel, H.	...Bombay
Cursetjee, Miss Manockjee	...Bombay
Curwen, H.	...Bombay
Cutch, H. H. the Rao of	...Bhuj
Dadabhoy, Cowasjee M.	...Bombay
Dady, Hormusji C. Dadyshett	...Bombay
Daley, F. J., H. I. M. S. "Investigator"	...
Dalgado, Dr. D. G....	...Sawantwaree
Daver, Framjee N.	...Bombay
Davidson, J. (c.s.)	...Mallegaum
Dempster, F. E.	...Sholapur
Descubes, A.	...Chickalda
Ditmas, A. R.	...Burmah
Dixon, Capt. R. C....	...Bombay
Doig, S. B. (C.E.)	...Ahmedabad
Douglas, Mrs.	...*Europe*
Dreckmann, Rev. F.	...Bombay
Dubash, Sorabjee D.	...Bombay
Duigan, S. A.	...Bombay
Dumayne, F. G.	...Bombay
Dumbell, H. C.	...Bombay
Dunsterville, J. H. C.	...Kolaba
Dymock, Dr. W.	...Bombay
Edgelow, F.	...Bombay
Ellaby, Dr. Charlotte	...Hydrabad, Sind
Elliot, A. (c.s.)	...Amraoti, Berar
Elliston, Major E. C.	...Poona
Eunson, Henry J. (C.E., F.G.S.)	...Morvi, Kathiawar
Fairbank, Rev. S.	...Ahmednugger
Fenton, Capt. L. L.	...Kathiawar
Ferguson, Dr. A. F.	...*Europe*
Fleming, W. N.	...Bombay
Fletcher, G....	...Bombay
Forbes, Mrs. C. H. B.	...*Europe*
Forrest, G. W.	...Bombay
Forrest, L. R. W.	...Bombay
Fox, C. E.	...Bombay
Francis, J. C.	...Bombay
Francke, A.	...Bombay
Franklin, J....	...Surat

NAME.	RESIDENCE.
Freeborn, E.	...Bombay
Fry, T. B.	...Poona
Furdunji, Jamsetji	...Bombay
Gaddum, F.	...*Europe*
Gama, Dr. A. da	...Bombay
Gaye, Dr. A. C.	...Poona
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Weir, Dr. T. S.	...Bombay
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Woodward, W. (C.S.)	...Nasik
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